The Welding Engineer

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Founded by L. B. Mackenzie, 1916

NOVEMBER, 1930 VOL. 15, NO. 11

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The Welding Engineer does not publish in its news or advertising columns any matter that deals with or refers to either personal or legal controversies.

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Readers of The Welding Engineer will find this index to contain the most accurate information obtainable relating to welding apparatus and supplies. The advertising section includes the principal manufacturers of the United States.

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EVERYBODY'S BUSINESS

BY FLOYD W. PARSONS

GREED and fear are the two worst business counsellors. Greed was the chief force shaping our actions last year and the year before. Prices were boosted beyond reason, and this caused managements to attempt to carry out unsound programs of expansion in order to justify the inflated values. Today we are under the influence of fear. Sentiment has been substituted for analysis and "nerves" for nerve.

Needed—The Will to Commence

Precedent and the lessons of experience have lost value. Vision, hope and imagination have largely disappeared. Yesterday people declared it was only the future that counts. Now they say that the present moment is all that matters. Some even believe it would be a good thing if calamity befell our supplies of basic materials, so that prices might be bettered.

People buy 80% of their purchases irrespective of how they feel. Business continues at the low point because widespread pessimism is perpetuating a buyer's strike, thereby reducing materially the remaining 20% of purchases, which really determine whether business is good or bad.

The opportunities for people in the United States are greater than ever before. Neither science, nor engineering, nor their accomplishments have been destroyed. Under-production has been substituted for over-production. In a number of lines of business it is not possible to secure supplies of manufactured goods until the factories receive the orders and turn them out. The driving power of abundant cheap money has taken the place of the restrictive action of tight money.

Here in the United States there are only 40 people per square mile. We have a wide diversity of climate and the world's largest supplies of essential raw materials.

We are far removed from the time when our population will be stationary. Births are exceeding deaths by eight per 1,000 per year. Although the birth rate is declining, our increase in population during the next decade, with immigration included, will average at least 1,200,000 annually. This means growing cities, increasing real estate values in urban communities, more homes and schools and a steady expansion in consumption.

Notwithstanding some recent opinions to the contrary, an increasing population is an economic asset. A stationary population would be a calamity to the farmer, damaging to industry and a threat to wages. In the words of one, "Not a single man would find work any more easily merely because no children were being born. On the other hand unemployment would be rapidly increased." We may regret over-production, but let us not worry about over-population.

Our billions of dollars will soon be put to work in building thousands more miles of surfaced highways, reforesting devastated lands, destroying insect pests, installing safety devices, constructing schools, providing amusement and recreation facilities, eliminating noise, extending heat and power lines to remote communities, removing city slums, and in creating millions of new and improved machines to take the place of equipment rendered obsolete by technical developments.

The readjustments of the past 12 months have prepared a solid foundation for a new era of trade and industrial expansion. The road ahead has been cleared for rapid advances in chemistry, engineering and the handling of economic and political problems. American business is carried on largely by great corporations, and the ownership of these has been shifted from Wall Street to Main Street. When Main Street finally insists on the stabilization of prices by outlawing the activities of selfish and irresponsible pools, the transformation will be complete.

Never has American business been confronted by fewer serious problems. Practically every form of menacing inflation has been corrected. We have greater available wealth to work with than any people ever had before. Labor is plentiful, production facilities are at hand and extravagance has been abolished. We have everything needed to make us a happy and busy nation except *the will to commence.*

This necessary willingness to go ahead will be manifested the moment constructive leadership is shown in the stock market. And when we do start, there must be clear recognition of the necessity of directing our business advances along new lines. Instead of concentrating attention upon the invention and construction of machines to replace labor in established industries, primary thought must be given to the development of new and backward industries, the opening up of virgin lands, the tapping of new sources of wealth, the harnessing of idle water-power, and the creation of higher standards of living in foreign lands in order to develop greater markets for our products.

Of course, the mechanization of industry must continue. It is to that chiefly we owe our world leadership. But it is our duty to give more consideration to the workers ruthlessly displaced than to the out-of-date machines we scrap. It is essential that industry find a way to settle justly its indebtedness to workers who lose that society may gain. For remedies we might consider a dismissal wage, shorter working periods, a vocational guidance service, and a system of Federal employment agencies.

In building our new era of prosperity, let us begin right by undertaking at once to work out the answers to age-old questions. Here is one that deserves attention: Is it impossible to prevent the periodic speculative orgies that draw in the public, destroy the savings of millions of people and hurl business from the heights of folly to the depths of despair? A social menace that refuses to lend itself to self-correction, must either be removed or controlled.

Let us quit temporizing with destructive forces that are continually destroying the stability of prices and preventing the uniform growth of industry. It is time that legitimate business struck back at its enemies—those who kick at high and low to suit the needs of speculation—who are more interested in wide price fluctuations than the steady production of goods.

Many great reputations and fortunes are born during periods of industrial distress and difficulty. But the men back of these outstanding accomplishments are the kind who clutch their aims with an iron grip. Blown this way and that, they only bend, and never break. They are steadfast in their opinions, never wait for the crowd, and do not change from a bull on Monday to a bear on Friday. What one does in spite of circumstances, rather than because of them, is the measure of his ability.

With human nature as it is, there is no way to prevent the coming of times when life loses much of its song. But we must remember that the effect of despondency is disastrous. It produces paralysis of effort and forces the individual to take his eyes off encouragements and look only at difficulties. No one is ever beaten unless he succumbs to discouragement, and such a condition never helped Mr. Citizen or his business over a difficulty, and never will.

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THREE GENERATIONS OF BRASS MAKING

EDITORIAL

Structural Opportunities

BOTH the contract welder and the structural-steel fabricator equipped with welding apparatus are in a position to profit by the studies made of the application of welding to structural-steel assemblies. When it comes to the erection of large bridges and steel skyscrapers it is obvious that only a very few firms can get any business at all on account of the limited number of such jobs. On the other hand, the number of smaller constructions to which welding may be applied is apparently endless, and the welding contractor or structural fabricator finds his business limited only by his own ability to sell the welding idea and to demonstrate the ability to design such work correctly and to produce satisfactory results. An interesting example which has recently been described is the construction of roofs for a station platform in a case where the existing station was to be widened. The first plans drawn up for this project provided for riveted construction, but an enterprising contractor found that he could reduce the construction cost by an attractive figure and redesign the whole job for welding. Although it required some skill in the drafting room to make a satisfactory job, the final plan was free from any complications which would make the actual welding difficult. This is a type of construction which may be in demand in practically any community where a trend toward increasing population may necessitate additional transportation facilities or where existing accommodations for passengers have become either worn out or obsolete and are in need of replacement. There has been such a big volume of successful work done on structures of this type without any reported failures that there should be no difficulties at all in persuading builders to accept welded construction from the point of view of dependability and economy. The real problem of the individual who solicits contracts for this work is that of developing a satisfactory design. It becomes more and more necessary for him to follow closely the details of all structural jobs and become thoroughly familiar with the ways and means of adapting welding to all kinds of small structures.

Discipline as an Accident Preventive

A PLEA for the purposeful elimination of sentimentalism from safety promotion work was the gist of a talk on "Foundry Engineering and Safety," by J. W. Beall, of The Ohio Steel Foundry Co., Lima, Ohio, given before the Safety Congress held at Pittsburgh, Pa., September 29 to October 3. The speaker also favored the charging of accident costs against the department in which the accidents are permitted to occur. "A safety man, like the top sergeant, must be as hard as his job," said Mr. Beall, who ventured the statement that every one of his hearers had at some time or other felt inclined to become hard-boiled when some workman had violated a safety rule or took a chance when the foreman's back was turned and got hurt in the shop and then in the swelled-chest attitude of a self-annointed martyr demanded compensation and special privileges denied to his coworkers who are more careful and better disciplined than he. Several illustrations of how discipline had been used effectively to bring careless workmen to their right senses were cited by Mr. Beall. One of these, which pertained to a worker in the welding-cutting department of a foundry, was as follows: "A man with a large family was employed in the welding department of an Ohio industry—a foundry. Week after week and month after month, this man was losing days and weeks as a result of disabling flashes from welding and cutting torches. He had been through all the stages of mechanical safety, the helmet and the eye shields, and the educational stage of safety meetings, safety bulletins and booklets. But to no avail. Then we tried discipline. Two years ago, when he returned to work after several days' absence on an eye injury, he was told that he had been transferred to a labor gang in the yard, where, for the sake of his family and himself, he would not encounter the hazard of eye flashes. He was told the transfer had been made at the request of the safety and welfare chief. A few days later he called on the safety man and declared he could not earn enough money on the yard gang to properly care for his big family. He wanted another chance in the welding department. That was just what we had hoped for. He went to his old job and for two years his name has not appeared on an accident report. He has been promoted and he sees to it that the men under his supervision in the welding-cutting department do not have occasion to go to an eye specialist for treatments for eye flashes. He had learned that a man who carelessly allowed himself to become a chronic repeater in the accident records was not a hero—not a valuable man in industry. And he had profited by his lesson." The man whose name is frequently entered in the accident reports was likened to the foreman who repeatedly permits bad castings to come through. Both are responsible for increasing production costs, and one is as deserving of discipline as the other.

Selective Training for Welders

THE use of psycho-technical examinations for those who are about to become students of the welding art has been tried and recommended by Piotr Tulasz, a Polish engineer. He has taken the position that although welding cannot be considered as an art which is especially difficult to master in comparison with other tasks, we are often obliged to place complete reliance in the operator himself on account of the lack of satisfactory methods of control, and it therefore becomes necessary to consider the characters and intelligence of the operator as well as his manual skill. A welding school operated at Katowice for the past two years has been requiring candidates for instruction for the past year to pass psycho-technical tests, and it is reported that the first results have already furnished some satisfactory and very instructive examples. It was shown, for instance, that a medical examination indicated that certain candidates for instruction had physical limitations which prevented their being able to do satisfactory work in this trade. Furthermore, the preliminary examinations showed the advisability of dividing students into groups according to their capacity so that men in different groups were given a different length of time for study and also a different set of job exercises. Another good result traceable to this experience is that, because the program was scientifically arranged, it was necessary to study the human problem a bit and decide just what importance could be attached to such qualities as vision, physical strength, muscular control, and hearing. In the mental examination, general intelligence is of course considered. Then comes memory, resourcefulness, the ability to act quickly, and muscular coordination. The results are so pleasing that the directors are looking forward to an improved examination system which will eliminate a great many of the instruction failures. Such procedure is practical, of course, only in cases where there is a surplus of applicants for instruction. But the expectations of those who have been working with the idea in Poland are not without confirmation in this country.

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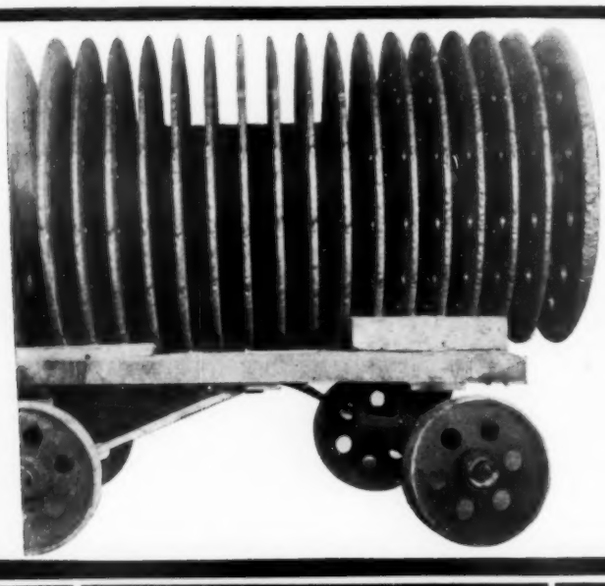

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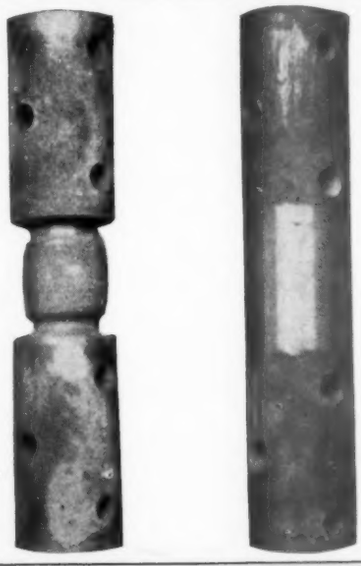

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WHITTIER, CALIFORNIA

Welded Tooling Reduces Shop Costs

By Using Correct Shop Procedure and Training Their Own Welders, the Kearney & Trecker Corp. Make Reliable Tools With a Saving in Cost and Time

By Charles C. Schoen*

ONE of the important problems confronting shop management today is the need to keep abreast of new developments, new methods, and new processes, with a view to adopting any change that will show a cost reduction over former practice. Such a program may seem expensive, but it will usually pay in the long run.

With the widespread interest shown in welded tooling—based on the many claims made for the process—we felt a strong desire to conduct tests by building some experimental jigs and fixtures to determine the comparative costs and the relative dependability between the so-called built-up tool and that of the cast construction.

Our first attempt at welded tooling was not so promising. It consisted of a small drill jig for the drilling of two holes in a small machine casting. The appearance of the jig was crude, yet the results were rather satisfying; and we learned enough concerning costs to realize the possibilities that welded construction offered. Our next few attempts, however, showed gradual improvements—enough so, in fact, to give us the assurance to adopt welded tools as standard construction wherever possible.

In eight months we have built approximately 200 tools of

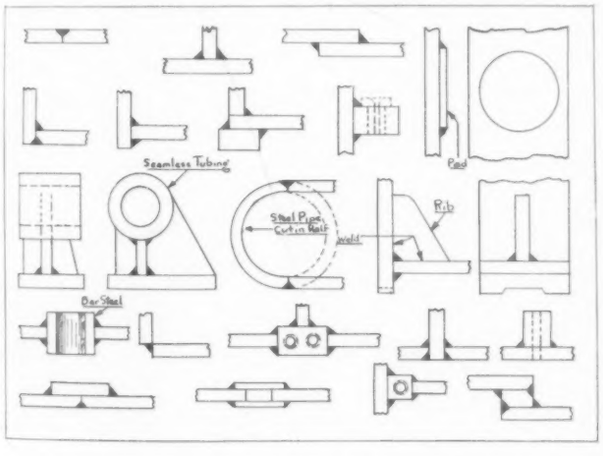


Fig. 1. A Group of Typical Joints for Welded Construction.

various kinds, ranging from small jigs to special machines, somewhat large in size. We have found three outstanding advantages in the use of welded tools—namely, a quality product, possible completion in a relative short length of time, and a reduction in manufacturing cost. Today, therefore, welded construction is taken as a matter of course, our tool-design department and toolroom knowing exactly what is wanted, and we seldom experience any difficulty in having the various jobs progress on schedule.

Lay Out All Work

Inasmuch as we are strong believers in laying out any form of construction—principally to have a permanent record for future reference, rather than merely to provide sketches or verbal instructions—our first step was to instruct our draftsmen in the art of welded design by having these

*Works Manager, Kearney & Trecker Corporation, Milwaukee, Wis.

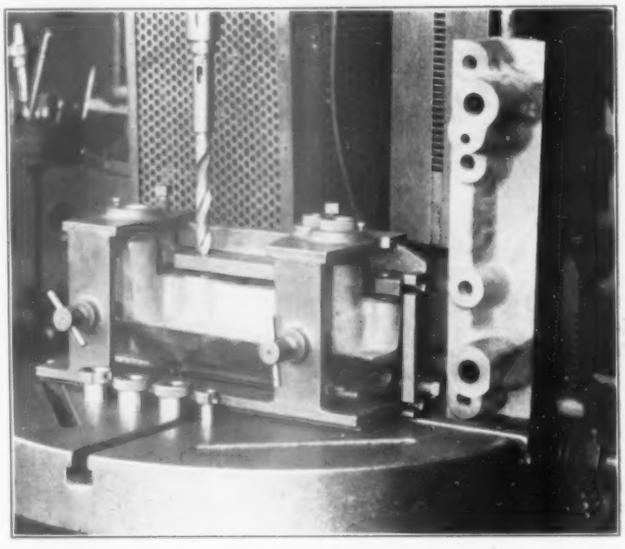


Fig. 2. Welded Drill Jig in Use, With One of the Parts to Be Drilled Shown on the Right.

men follow the progress of the tools through the shop for the purpose of determining any difficulties that may develop. Various valuable points in welded design were soon detected, so that these men now have the general knowledge required to lay out most any form of tool. Perhaps the outstanding knowledge gained was the required thicknesses for walls, braces and supports, the proper welded joints to specify for a given design, and miscellaneous constructional features that are considered basic to the built-up method of construction.

Our operations, or general procedure of construction,

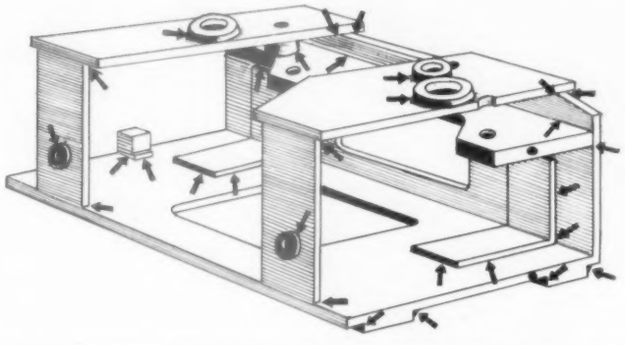


Fig. 3. Illustrating Construction of Drill Jig Shown in Fig. 2. Welds Are Indicated by the Arrows.

were then based on our experience with the first few tools constructed, which closely follow the usual practice—layout, cut out with the oxy-acetylene torch the various members required, tack weld the units together, inspect for alignment and correctness, arc weld complete, anneal, sandblast, paint, machine complete, and give a final inspection.

Welders Should Be Familiar With Tool Making

We have found it advantageous to select and train welders who not only are familiar with welding but who also have

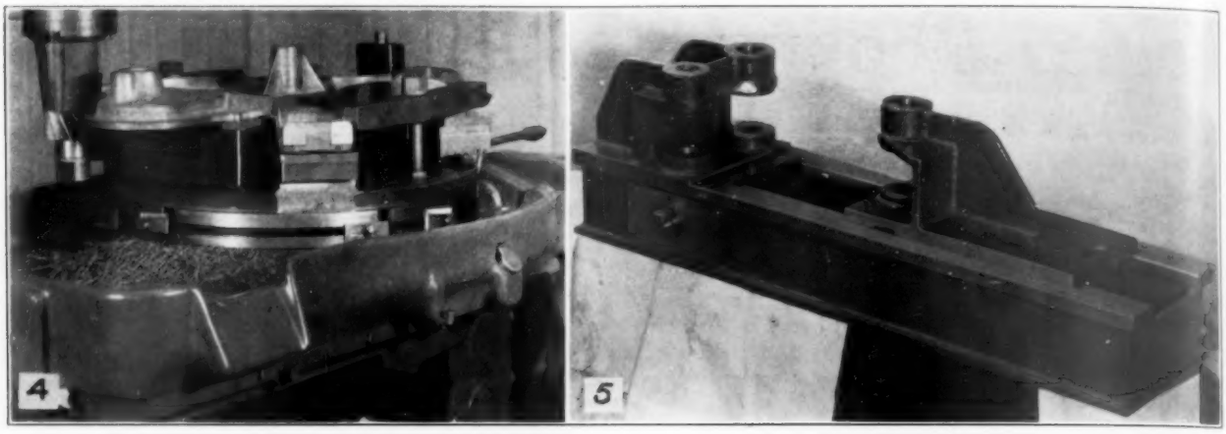


Fig. 4. Welded Tool for Milling the Faces of a Casting for a Washing Machine.
Fig. 5. Special Tool, With Two Stationary Spindles and One Mounted on a Slide.

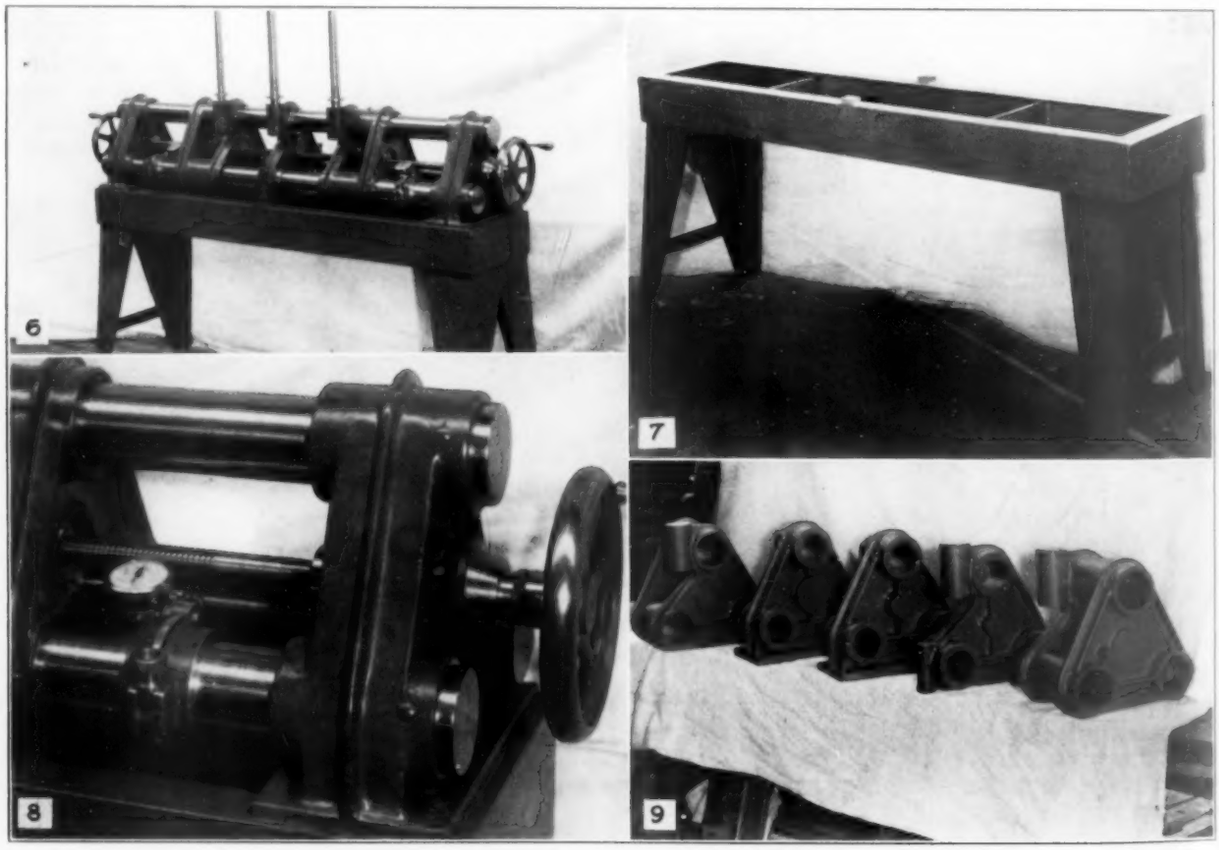
a general knowledge of tool construction, in order to maintain our high standard of workmanship and to reduce errors to the minimum. Although we have drawings, there are problems that come up from time to time that the experienced welder will discuss with the proper authority rather than run the possibility of making an error by proceeding without seeking further information.

We have always built our tools on schedule, and are now able to carry out the same practice with the newer welded tools. This work is handled by our production-control department, and the procedure does not vary from former practice. The routing is based on the classification of the tool to be made and whether or not it is wanted in a hurry. The daily progress is always in hand, so that it is possible to determine if the schedule is being maintained.

Since no patterns are required for welded tools, a substantial saving in elapsed manufacturing time is made possible. Quite often we are able to have welded tools completed in the time it usually requires to obtain castings. This feature, of course, is of great value, because we are not unlike thousands of other plants that find rush orders a necessity.

A miscellany of welded joints used in building different types of jigs and fixtures are illustrated in Fig. 1. These examples are representative of the general construction, although each design is a problem within itself, and, of course, must be laid out to suit specific conditions. With some experience, however, little difficulty is encountered in solving the various problems that come up, since welded construction is so flexible in its nature and in view of the great number of practical joints that can be effectively used.

A representative form of welded drill jig is illustrated in Fig. 2, showing at the right the part to be drilled. Seven holes, ranging in size from ½ to 1 1/16 in., are finished with this jig. In Fig. 3 will be seen the constructional details



Figs. 6-9. Another Welded Tool and Details of Its Parts. The Entire Frame and Braces Comprise Standard Drawn or Rolled Sections, Plates, and Tubing, Welded Together.

of the tool. The body is made of steel plates ½ in. thick, while the blocks for the bushings are made of suitable size and welded in place as shown. Almost all the filler welds are of ⅜-in. size, but a few are ½ in.

The machining of a jig of this type does not differ from the usual practice, inasmuch as the first operation is to machine the bottom face and then to do all the subsequent operations from this face. The back and bottom plates of the jig body are cut out to lighten the tool, and pads and bosses are welded to the plates in order to strengthen the points where screws and locating surfaces are required.

In Fig. 4 is shown another form of welded tool arranged for the milling of four radial faces of a washing-machine casting. The fixture is mounted on a rotary table of a Milwaukee milling machine and is provided with hardened locating surfaces for alignment of the part to be machined. Locating blocks of this type are usually made as separate pieces, and are then hardened and ground and attached with screws and dowels. This form of construction does not differ from the cast-iron type of fixture.

In Fig. 5 is shown a somewhat different form of welded construction. The upright member at the left has two spindles that are permanently located on the base, whereas the third spindle, shown at the right, is mounted on a slide. The ways for the slide are made of bar steel, welded in place, machined and handscraped to insure an accurate bearing surface. This unit illustrates various constructional features using a variety of the joints shown in Fig. 1.

The machine illustrated in Fig. 6 is of rather novel design, and clearly shows additional possibilities of welded construction. In Fig. 8 is shown a close-up view of one end of this machine, and Fig. 9 shows the slide and end braces. The base of the machine is illustrated in Fig. 7. Each brace (see Fig. 9) has a center plate in which holes were cut to exact center distance to receive three lengths of tubing. To this were welded additional rounds, flats and tie plates to complete the construction as illustrated. This type of construction was used for the remaining braces.

All Parts Cut From Tubing and Rolled Stock

The construction of this machine might look somewhat complicated at first, but in reality the various units are of a simplified nature. Seamless tubing, round bar stock, and flat plates are used in making the various supports and end braces. The three rails on which the supports slide are

Fig. 10. Tail Stock for Three-Spindle Indexing Mechanism and Housing for Special Indexing Head, Both Welded.

made of bar steel, ground to size, and the base is made of various sections of channel iron, with angle-iron legs, all braced by suitable plates.

In Fig. 10 are shown two other rather interesting units made of welded construction, these being a tail stock for a three-spindle indexing mechanism and a housing for a special three-spindle indexing head. The constructional features of the housing for the indexing head are shown in Fig. 11, this being a diagram of a cross-section through the center, illustrating the various welded joints. The spindles are operated by means of gearing and the proper settings are attained by a dividing-head plate mounted vertically on the top of the head as shown. The ends of the body are made of pipe sections, cut off to the proper length and then sawed in two. These pieces are welded to flat plates, thus forming the body to which the various bosses, ribs, and bearing surfaces are welded.

Welding Reduces Costs About One-Fourth

The costs of our welded tooling offer a rather interesting comparison. Although the figures given herewith cover only the manufacturing costs, they do not include the estimated saving which is gained by shortening the length of time required to complete a tool. Sometimes this saving is far

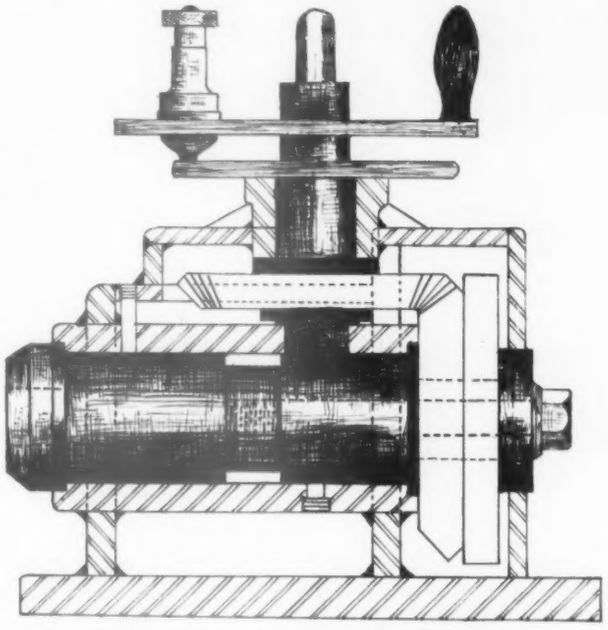


Fig. 11. Middle Section Through Housing Shown in Fig. 10, Illustrating the Welded Joints. The Center Spindle and Gearing Are Shown in Place.

more valuable than the actual cost figures, hence this particular feature should not be overlooked.

For some of the costs given, it has been necessary to estimate the construction when made of cast design. We have found from past experience that our estimates are very close, however, and the comparative figures can, of course, be considered practical.

The fixture illustrated in Fig. 2 cost 23% less when made of welded construction than when embodying castings. The fixture in Fig. 4 showed a reduction of 24%; while the body of the three-spindle dividing head, illustrated in Fig. 10, completely machined and ready for assembly, showed a cost reduction of 26%. The costs of making the gears and bushings and assembling them into place would be the same in both cases.

The welded parts illustrated in Fig. 6 cost approximately 16% less than the estimated cost of patterns.

Development of Welded Tools Is a Gradual Process

Perhaps these cost reductions will be bettered as we gain more experience in the construction of welded tools, although from the information given it should be evident that the economies are worth consideration. We find certain limitations in welded tooling and at this time do not attempt to construct all our tools by this process. We are often called upon to furnish our machines complete with tooling to suit exacting conditions as specified by our customers, and we are gradually developing our welded construction to take care of the necessary milling fixtures needed. The majority of our work so far has been in the construction of jigs and fixtures for our own use, which are needed in the building of our line of Milwaukee milling machines and Mil-waukee-Mils.

VAN DYKE OF RYERSON COMPANY GIVES TALKS ON SPECIAL STEELS

G. Van Dyke, manager of the Special Steels department of Joseph T. Ryerson & Son, has been delivering a number of lectures at various points throughout the country on alloy steels, tool steels, and stainless steels. Recent meetings were held in Minneapolis, Cincinnati, and Milwaukee, when he spoke to about two hundred engineers and shop men on each occasion. The lectures usually cover the better part of a day.

The talk and demonstration, originally prepared for Ryerson salesmen and service men, covered two days, but has now been condensed to about three hours on the lecture and two hours on practical demonstration and instruction, including welding. The first gives a general background of the stainless-steel alloys and classification of the various analyses, such as high-carbon stainless steel, low-carbon stainless iron,

G. VAN DYKE

high-chrome stainless iron, chrome-nickel stainless iron of the 18-8 type, and chrome-nickel alloys of the heat-resisting type. The various characteristics of these different products are discussed, such as corrosion resistance, machineability, formability, weldability, resistance to scaling, etc.

The fabrication of the 18-8 type is covered in considerable detail, including its general application to various industries. A display of samples is shown, including white pickled and polished sheets, cold-rolled strips, screws, nuts, wire, samples of deep drawing, polishing, etching, welding, cooking utensils, etc. Another important feature covered in the lecture is the use of high-temperature-resisting alloys at elevated temperatures as regards physical properties, resistance to oxidation or scaling, and creep values. Time is also given to alloy steels and tool steels.

The entire lecture and demonstration is of a strictly non-technical character and is given in such a way as to be clearly understandable by superintendents, shop foremen, welders, and others who may or may not have had technical training. All charts and tables used in the lecture are reproduced in mimeograph form and are supplied to all those attending the lecture.

Further meetings are planned for various principal cities throughout the country, particularly where customers or others interested have asked for meetings.

FIFTH PURDUE WELDING CONFERENCE TO BE HELD IN DECEMBER

Notice has been received that the Fifth Annual Welding Conference will be held at Purdue University, Lafayette, Ind., on December 10, 11 and 12. These welding conferences, which are sponsored and conducted by Purdue's Engineering Extension Division, are regarded in the Indiana and Illinois district as a high spot in the winter program of welding meetings. Three days are spent in a series of discussions, lectures and demonstrations, summarizing the progress which has been made in the applications of the fusion welding processes during the past twelve months. The program is arranged to deal with all processes impartially and to explain their usefulness in both production and repair work. Manufacturers of equipment and materials always have some new and improved products to show, and experienced demonstrators to explain new methods of procedure. Welding shops and industrial plants throughout the state of Indiana are invited to send their welders, supervisors, foremen, or engineers to attend as much of the conference as they can and to seek information freely by asking questions. Those who do not feel able to attend the complete program, but would like to attend those sessions which would be of most interest and value to them, should write for a copy of the program, addressing the request to the Engineering Extension Division, Purdue University.

TIPS PUBLISHES HUNDREDTH NUMBER

The November issue of *Oxy-Acetylene Tips*, a monthly publication of the Linde Air Products Co., carries an editorial calling attention to the fact that that issue is the one-hundredth which has been published. This interesting and valuable house organ was founded in August, 1922, when the industry was just beginning to show appreciation for the value of oxy-acetylene welding and cutting as demonstrated by its usefulness during the World War. The magazine was first intended primarily for members of the Linde organizations, but the distribution has steadily increased until at the present time it has a great national circulation among the users of Linde products. The development and growth of this magazine have kept pace with the expansion of the oxy-acetylene processes, and its editors express the hope that its value and importance to users of these processes will continue to increase.

BRITISH JOURNAL OFFERS PRIZES FOR BEST ARTICLES ON ARC WELDING

Beginning with the November issue of *The Welder*, a monthly prize of £5 5s. is offered for the best illustrated article describing interesting jobs undertaken by the electric-arc welding process. The prizes are being offered by the Alloy Welding Processes, Ltd., who are publishers of *The Welder*. The articles are to be written on one side of the paper only and should not exceed 500 words in length, and they must describe work carried out with material manufactured either by Alloy Welding Processes, Ltd., or Premier Electric Welding Co., Ltd. Entries must bear the name and address of competitors and be forwarded to "The Editor, *The Welder*, Ferry Lane Works, Forest Road, London, E. 17, England," the envelopes being clearly marked "Competition." The object of this is not so much to obtain literary essays on welding, as to obtain details relating to interesting welding practices. Each article submitted must be illustrated with photographs or drawings.

Butt Welding Tubular Shapes

T-Joints in Tubular Frames, Made by Flash Welding, Result in a Structure That Is High in Strength and Neat in Appearance

TUBE shapes continue to be a popular material in the field of fabrication of metal products. The high strength per unit weight of the tubular section is well known; and recent investigations have shown that when these tube shapes are produced by welding, the welded portion has practically the same physical properties as the parent metal.

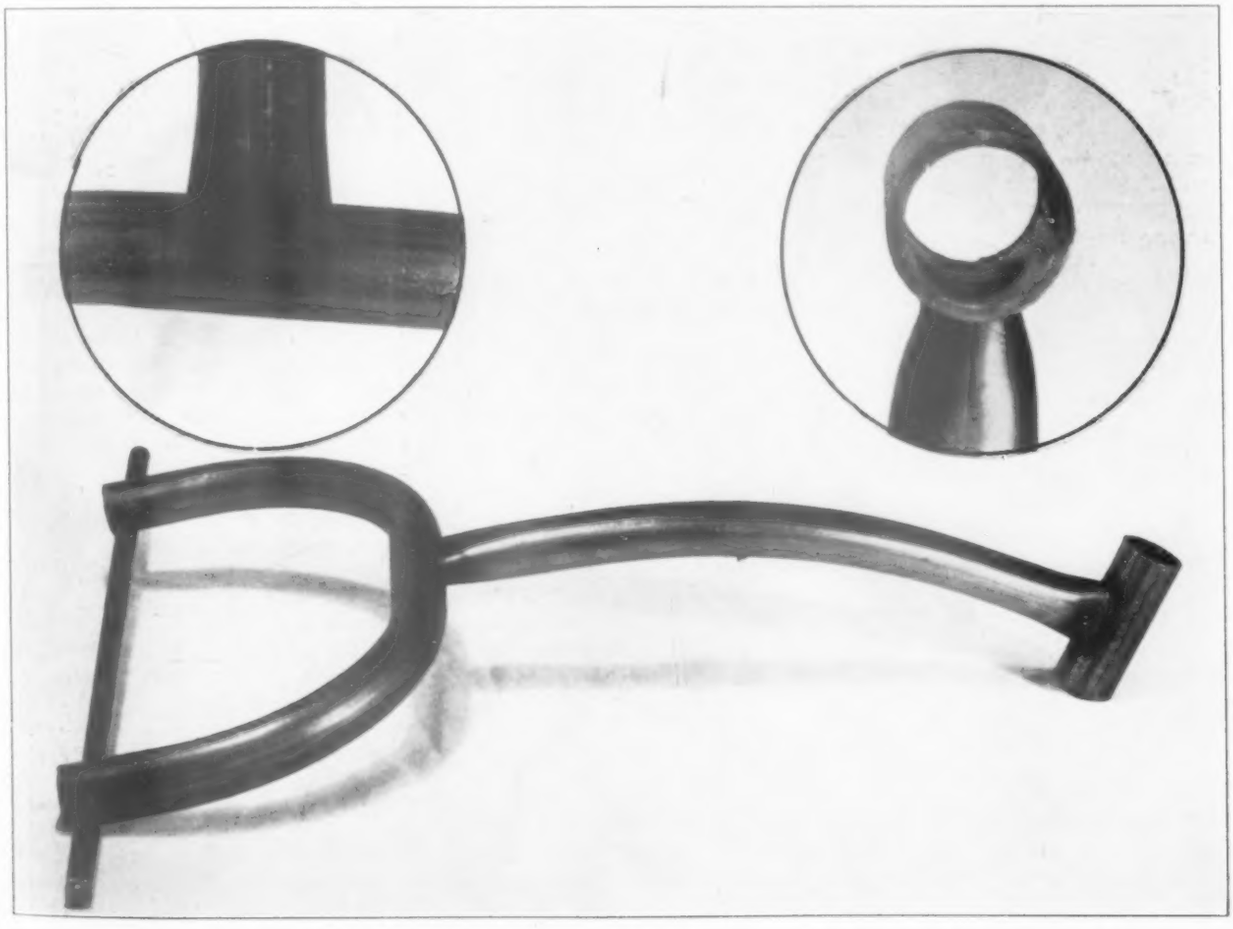
There are being welded at present a number of typical products involving the use of steel tubing, such as furniture, bicycles, racks, typewriter and adding-machine stands, and similar products. The making of straight butt welds in this tubing has been done quite extensively for a number of years, employing in many cases the electric resistance butt welder. There have also been some cases where a satisfactory T-weld has been made by the resistance process. Some particularly interesting work with T-welds has been done at the plant of the Metalcraft Corporation, St. Louis, Mo., using a machine developed by the Taylor-Winfield Corporation, called the B-8-45° angle top butt welder. The general appearance of this machine is shown in one of the accompanying illustrations, the one shown being of the hand-clamp, toggle-upset type.

One of the products of the Metalcraft Corporation is a child's tricycle. Inspection of the photographs shows that the portion of the frame connecting the head piece to the rear wheels is assembled of three pieces of tubing, using two butt welds.

This tubular construction consists of 1-in., 16-gage welded tubing for the two long pieces, while the tubular piece for the head is of slightly larger size. A comparison of this method of fabrication with that used by some manufacturers of tricycles will immediately suggest the advantages gained by welding. Less material is used, because there are no fittings, and less labor is required because there are fewer joints.

Referring again to the illustration which shows the welded framework, it will be noticed that in making this weld the piece of tubing which forms the stem of the T is deformed, or slightly flattened, the long axis of the flattened section being parallel to the tubing which forms the top of the T. A close-up of the weld is also reproduced, and here the method of preparation is more easily seen. It is this method of forming the end of the tube which has made possible the making of these welds with uniform quality. The forming operation is a simple one, so that in production this method eliminates complicated designs involving stampings and fittings, and is accordingly very economical.

The welding machine on which this job is done is of the flash butt-weld type. The dies are placed at 45 deg. so that the work can easily be placed in or taken out of them and at the same time make it easier for the operator to see the work. The transformer is also placed at 45 deg. and at right angles to the dies, which brings it to the rear of the



Frame of a Child's Tricycle Made by Forming Tubes and Butt Welding Them in a Flash Welder. The Insets Show Close-Up Views of Both Joints, the Slight Upset Formed by the Welding Operation Being Evident in the One on the Right.

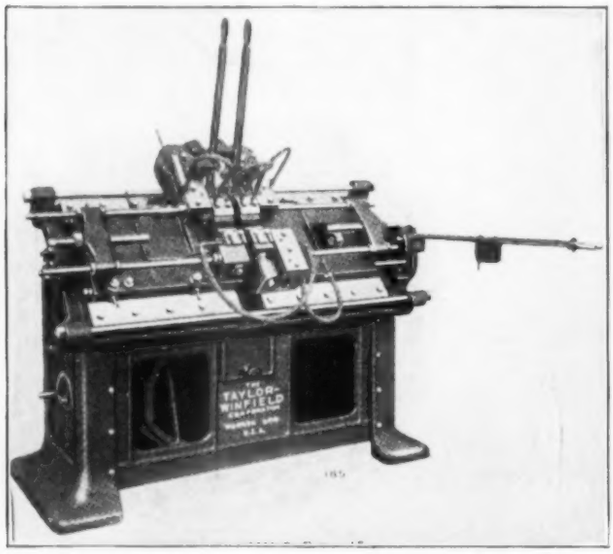
machine and out of the way of the flash and scale. The lower edge of the upsetting slide is carried on roller bearings, making a very sensitive upsetting arrangement. Machines of this general design can be furnished with capacities ranging from ¼-in. round to 2⅞-in. round. They are water-cooled and can be furnished with air-operated clamps and automatic upsets. Dies are adjustable for the regulation of the take-up in each weld and also for accommodating tubing of different sizes.

Obviously, the equipment for this kind of welding is available in a range of capacities which makes it adapted to the

"Junior Transportation" Offers a Fertile Field for Butt-Welded Tubular Frames.

welding of a great many tubular structures. It may not always be possible to use a design which makes it necessary to change the form of one of the tubes before making the weld, but wherever it is possible to follow this plan, the user gets rid of the difficulties encountered when one attempts to butt weld the straight cut end of the tube directly to the outside round surface of the abutting tube.

The Metalcraft Corporation also do spot welding extensively in their plant on such articles as sidewalk scooters and a variety of other toys. In other words, they manufacture "junior transportation." It is their policy to employ



Flash Butt-Weld Type of Welder Used for Tricycle Frames.

the same methods for providing safety and strength in the manufacture of these articles as are employed by automobile manufacturers and manufacturers of other forms of transportation.

In view of the utility of the welded tubular type of construction, manufacturers in a number of different lines will probably find the design illustrated to be of considerable interest. These joints are made at a very low cost when there is large production, and leave very little work for the finishing department after the weld is completed; and furthermore, the manufacturing processes for the production of welded steel tubing are being constantly perfected so that there is a steady improvement in the direction of strength and uniformity as well as an indication of lower costs.

CHICAGO SECTION, A. W. S., HEAR TWO GOOD PAPERS AT NOVEMBER MEETING

The regular November meeting of the American Welding Society, Chicago Section, was held Friday evening, November 7, at the Palmer House, Chicago. Forty-five members and guests were present for the dinner which preceded the meeting, and about fifty more came in later to hear the two papers which were presented.

The first paper, "The Influence of Welding on Our Product," was read by W. V. Emery, welding superintendent of the Harnischfeger Corporation, Milwaukee, Wis. The story of the growth of a welding department from one gas welder to a department using five gas welding and cutting outfits, twelve arc welders, two spot welders, and two automatic cutting machines, was an interesting one. The operations involved in the manufacture of heavy-duty excavating machinery include gas and arc welding of sheet metal, heavy plate welding, the substitution of welded for riveted construction, the substitution of fabricated steel for castings, laminated cutting, spot welding, and a host of other interesting subjects. These were illustrated with lantern slides, which showed the important points involved in redesign for welded construction.

The second paper on the program, "The Panel Heating System," was presented by F. G. Outcault, of the engineering staff of the Linde Air Products Co. It described a system of heating for buildings, which depends upon welded joints for efficient operation. The fact that one of these systems has been in operation in England for twenty years without showing any sign of joint difficulty, is evidence of the durability and dependability of gas welding in the installation of heating systems. A motion picture which followed the talk showed the installation of a panel heating system in the new British Embassy at Washington, D. C.

ARC-WELDING CLINIC AT MILWAUKEE NEXT MONTH

Wisconsin's first Arc Welding Clinic will be held at Marquette University, Milwaukee, on December 1, 2 and 3, under the joint auspices of Marquette University and the Northwestern Manufacturing Co. This clinic will consist of:

1. A series of talks by qualified speakers. Each will give information on some specific interesting and important phase of arc welding.

2. Demonstrations. Several operators, each with an arc welding unit, will be on duty during the entire period of the clinic. Each operator will be prepared to demonstrate and give specific information on a particular phase of arc welding.

3. A display of arc-welded products. This will include samples and photographs of metal parts fabricated or repaired by the arc-welding process.

4. Test of welded samples. If visitors to the clinic desire to bring samples of their work, such samples will be tested in the mechanical engineering laboratories of Marquette University.

The demonstrations and display will be held on the ground floor of the Marquette Gymnasium, Sixteenth and Clybourne Sts. The talks, many of which will be illustrated with slides, will be given in the lecture hall of the Dental Building, one-half block from the demonstrations. The hours for display and demonstrations will be from nine to twelve, and one to five, with an evening session on Tuesday, from seven to nine.

Gas Welding Progress in 1930

Papers Read at International Acetylene Association Convention Show Gains in Volume and Improvements in Procedure of Applications

COL. ROBERT ISHAM RANDOLPH, President of the Chicago Association of Commerce tendered the welcome of the city to the International Acetylene Association on the event of their Thirty-first Annual Convention at the Congress Hotel, Chicago, November 12, 13 and 14. Confidence in the steadiness of America's vital industries was expressed by Marc Rose, editor of "Business Week," in the keynote address of the convention. The response, in behalf of the International Acetylene Association given by Mr. Henry Booth

COL. ROBERT ISHAM RANDOLPH,
President, Chicago Association of Commerce.

of the Shawinigan Products Corporation of New York and the address of Mr. C. A. McCune, President of the Association echoed this note of faith in American business. The balance of the morning was taken up with the report of the Secretary-Treasurer and Auditing Committee.

The afternoon session devoted to the Metal Working Industries was keyed up to a high pitch of interest. Mr. Earl C. Booth, an engineer of the Noblitt-Sparks Industries, Inc., aroused great interest by his address, "Production Welding by the Oxy-Acetylene Process." Mr. Booth illustrated his talk by lantern slides showing actual welding operations by the oxy-acetylene process in the factory. Every detail was followed with keen attention by the audience. Mr. E. A. Doyle, chairman of the Oxy-Acetylene Committee of the I.A.A., read the report of the "Oxy-Acetylene Committee," a resume of the progress of the use of this process in 1930. The report had been printed in the form of a 73-page booklet to facilitate discussion, and the speakers who discussed various phases of it expressed the greatest enthusiasm for the possibilities and progress of the oxy-acetylene processes in the metal working industries.

At the opening of the building session, which was presided over by Robert Knight, President of the Building Officials Conference of America, Professor James A. Griffith, of Oregon State Agricultural College, focused the attention of his audience upon an unusual demonstration augmenting his speech on "Gas Welded Structural Joints." Professor Griffith gave a scientific demonstration of the testing of welds by amplified stethoscopic sound. The practical value of the demonstration was obvious and increased the interest in the other papers presented. Prominent on the program was a paper entitled "Welding in the Construction of a Home" by Eric H. Ewertz, Consulting Welding Engineer. The interest evinced indicated that the subject was very near the heart of every person present. The "Structural Welding Code of the American Welding Society" was discussed by Mr. H. H. Moss of The Linde Air Products Co. This code, which was outlined and defined by the American Welding Society last year has been accepted by building commissions in many

W. D. FLANNERY,
Elected President, International Acetylene Association.

cities and has done much to further the progress of oxy-acetylene welding. Mr. F. Eder, Engineer of the Robert W. Hunt Co. of New York, presented another angle of oxy-acetylene welding in the building industry in his paper "Securing Acceptance of Structural Welding by Architects, Structural and City Engineers."

R. E. Gilmore, Vice-President of the Association of Consulting Engineers, presided over the session devoted to building piping. The various welding piping systems of the Montgomery Ward & Co. Building was the subject of a talk by Mr. W. H. McCaully, Chicago Architect. Mr. F. B. Quackenboss of the Western Factory Insurance Association of Chicago spoke on "Oxy-Acetylene Welding as Applied to Sprink-

ler Systems." The final paper of the session, presented by R. E. Fritsch, Vice-President of Tube-Turns, Inc., on the "Development of Oxy-Acetylene Welding in Various Pipe Fields," brought out most effectively the spread of oxy-acetylene welding for piping systems.

The final day of the convention presented facts on the development of welding in the transportation and public utilities fields. H. E. Gannett of the operating department of the C. B. and Q. R. R. presided at the transportation session in which were described the rapid strides made by the use of oxy-acetylene welding on railroads, in automoble and aircraft manufacture, and in shipbuilding. Men familiar with railroad welding in theory and practice presented a dramatic

Professor Griffith Demonstrating Stethoscopic Method of Weld Testing With an Amplifier and Loud Speaker.

story; welding of rail ends was the subject of a paper presented by S. E. Tracy, track welding supervisor of the Chicago Burlington & Quincy Railroad; "General Railroad Welding" by Master Welder G. H. Gjertsen of the Northern Pacific Railway Co.; and "Reclamation Welding and Cutting" by G. A. Lieber of the Missouri, Kansas & Texas Railroad Co. presented facts on all phases of welding in their industry. A high spot of the morning was the paper presented by Mr. Charles Froesch of the Fokker Aircraft Corporation of America on "Commercial Aircrafts and Welding." Motion pictures of the celebrated Dornier DO-X, multicolored airplane capable of carrying over 150 people, heightened the interest of the audience. Mr. W. M. Dunlap of the Aluminum Co. of America outlined advantages of welded aluminum tanks for automobile and aircraft. Shipyards utilize the benefits of the oxy-acetylene welding process as much as the newer transportation systems. Mr. James W. Owens, long associated with welding in the shipbuilding industry, concluded the transportation session with his paper "Working Against Time and Cost with the Oxy-Acetylene Process in Shipyards."

The afternoon was devoted to discussions of the use of oxy-acetylene welding by Public Utility Companies, George C. Baldwin of the Public Service Company of Northern Illinois presiding. Mr. G. O. Carter of The Linde Air Products Co., New York, supplied a paper from a wealth of diversified information on the "Success of Oxy-Acetylene Welded Pipe Lines." Nothing succeeds like success and Mr. Carter's paper struck the note upon which the Convention began and ended. Mr. L. A. Kirsch, of the Midland United Co., presented a paper entitled "Oxy-Acetylene in Local Gas Transmission and Distribution." The concluding paper of this session "Economies of Welding in Operation and Maintenance of Gas Transmission Systems" was prepared by Eric Larson, Supt. of Gas Distribution, Long Island Lighting Co., Bay Shore, L. I.

Statistics obtained from the registration desk at the close of the meeting showed that the total attendance during the three days of the convention was nearly 450 individuals. This exceeded all previous attendance figures by a wide margin. The number of representatives of equipment and supply manufacturers was somewhat smaller than in previous years, but the attendance of users of the oxy-acetylene processes was estimated to be in the neighborhood of fifty per cent greater. Their interest in the program was manifested in two ways; first, they contributed a great deal of interesting and useful information in the discussions of the papers read; and second, they signified their intention to continue contact with the activities of the association in several cases by applying for membership. Sixteen new members were enrolled on the last day.

An interesting innovation was the display of a number of gas welded products, including piping, aircraft fuselage, aircraft sample joints, and tanks, in the corridors adjoining the meeting room. There was also on all welded exact scale model (1½ in. to 1 foot) of a Fokker Super-Universal Airplane displayed under a spotlight in the lobby of the Congress Hotel. This model was similar in design and of the same oxy-acetylene welded construction as the planes used by Admiral Byrd, Commander Kingsfield Smith, and Miss Amelia Earhart.

At the close of the final afternoon session the annual election of officers was held. At this time W. D. Flannery of the K-G Welding and Cutting Company, New York City, was elected president. Mr. Flannery has been prominent in association affairs for many years and had become widely known throughout the industry for his activities in connection with several committees. During the past year he has added to this a considerable amount of work on behalf of publicity matters. Under his administration the association is assured of enthusiastic leadership and the application of a great deal of energy to the general welfare. In this activity he will be ably supported by the newly elected vice-president, W. C. Keeley, Jr., of the National Carbide Sales Company, New York City.

In accepting his re-election as secretary and treasurer, A. Cressy Morrison embarks upon his twenty-fifth year in that

A Picture of an All-Welded Model of a Fokker Airplane Having the Time of Its Life.

office. Directors elected for three-year terms were: W. A. Slack, Torchweld Equipment Co.; H. S. Smith, The Prest-O-Lite Co., Inc., and C. A. McCune, Welding Engineering and Research Corporation. W. H. Ludington, Air Reduction Sales Co., was elected director to fill the two-year unexpired term of W. C. Keeley, and Geo. B. Walker, Union Carbide Sales Co., was elected director for one year to fill the unexpired term of L. E. Ogden, Oxweld Acetylene Co.

The most important single event in the program of the International Acetylene Association is the annual award of the Morehead Medal. This medal was established several years ago as an annual award for contributions of outstanding merit to the development of the use of Carbide of Cal-

cium and its derivatives. The medal is provided for by James M. Morehead in memory of his father, James T. Morehead, who was the founder of the carbide industry in this country. This year the medal was awarded to J. B. Johnson, Chief, Material Section, War Department, Wright Field, Dayton, Ohio. Mr. Johnson contributed generously to some of the most important research work which led to the successful application of oxy-acetylene welding in aircraft construction. He has written many papers on the subject of aircraft welding and is the author of a book on the subject. The Morehead Medal and the certificate of award which goes with it, were presented to him at the close of the annual banquet, by W. A. Slack, past-president of the International Acetylene Association.

MARCH, 1924, ISSUE WANTED

The issue of *The Welding Engineer* of March, 1924 (vol. 9, no. 3), is lacking from the files in the Library of Congress. Herbert Putnam, librarian asks the aid of readers in supplying a copy of this issue and requests that it be mailed to the Periodical Division, Library of Congress, Washington, D. C.

ISSUES SAFETY BULLETIN FOR EMPLOYEES

The Palmer's Radiator and Body Works at Phoenix, Ariz., operates a large plant for automobile repair work in which about 50 men are employed. Noticing that some of the men in the plant were apparently not familiar with the rules for the safe handling of oxygen and acetylene cylinders, they recently published a special bulletin in which they pointed out some of the hazards involved in the handling of these cylinders and requested all employees to observe the rules, which would prevent accidents. A copy of this safety bulletin was given to each employee so that the rules would be known alike by the operators and by those who did not come in direct contact with the welding and cutting operations.

DEVELOPMENTS IN PIPE-LINE JOINTS

While welding is being used on a large scale for joining sections of pipe together in the field, the plain-end line with rubber joints still retains its advantages in some cases, according to a paper entitled "Some Aspects of High-Pressure Natural-Gas Transportation," presented before The Western Society of Engineers, on Feb. 17th, at Chicago, by R. S. Lord, president of the Hope Engineering Co., of Mt. Vernon, Ohio. In deciding which of several methods of joining pipe is best for any given condition, several factors must be given consideration, such as tightness, flexibility, ease of making repairs or changes for connecting in branch lines, cost of material and of machine work, and speed and cost of construction. To quote from Mr. Lord's paper:

"After the invention of the acetylene welding equipment, there was a rapid turn to this method of joining pipe. However, it seemed for a time that this change was not justified on account of more or less faulty equipment and a still larger percentage of faulty workmanship. As a result of this, the welding of pipe lines suffered more or less of a relapse without entirely going out of fashion. Within the past few years, however, improvement in methods of welding, as well as in equipment for welding, has again increased the amount of welded line until at the present time it is much more popular than ever before. Competent welders are very numerous now. But the fact still remains that there is in this method of construction a very large factor of the human element; and while it is possible to produce 100% welds, there is more probability of inferior joints in this method of connecting than in the old rubber-sealed lines. The best welder sometimes makes a mistake, the poor welder very frequently makes a poor job.

"We recently had a report from a prominent natural gas man, who told of his experience in welding a rather large pipe line. He stated that the welders were more temperamental than a prima donna; and three times as many welders were employed as were needed on the work—one-third were coming, one-third were working, and one-third were going.

"While all of this is true, there has, no doubt, been a marked improvement in welding lines; and with certain limitations, dependent upon climatic conditions and diameters of pipe, the welding process should be satisfactory. There are methods of welding recently developed that have shown almost perfect record of successful joints, even in rather large diameter, and there is no doubt in the writer's mind but what the improved methods will be so common that a still greater use of that method of joining lines will be the practice of the future.

"This does not mean that we are ready, as yet, to drop the rubber-sealed coupling. In the writer's opinion, it and the compressing station have been of more value than anything else in the record of natural-gas transportation up to the present time. Improvements in pipe, which are already being made, and improvements in welding, some of which have already been proven, will, no doubt, do a great deal for the future.

"Among the recent improvements which have made good, are pipes made by cold-rolling steel plates, and electrically welding the longitudinal seams. These pipes are usually made of comparatively high-carbon steel, having a tensile strength much above the ordinary steel used in pipe that must be welded by the old method.

"Among the new field-welding methods is the one employing special electric welding equipment on bell-and-spigot shapes with a dam-like ridge on the spigot end so placed as to meet the over-lapping bell and give added strength to the joint as well as some convenience in placing.

"The further use of corrugated steel expansion members tends to relieve strains of irregularly supported pipe and at the same time form a convenient method of making bends.

"These improvements, mostly made by one manufacturer, are now rapidly being met by other makers. In fact, we understand that still greater tensile strength is in prospect. This will undoubtedly be brought about through the use of seamless tubing in sizes larger than are now made.

"Some of our engineers recently in Germany report that in the large gas lines recently laid from the Ruhr Valley the joints are made by rolling a special corrugation at each end of the pipe in such shape that one end forms a bell and the other a spigot. After insertion, the bell is hammered or crimped over the spigot ridge to form a lock, which is then sealed by welding—either acteylene or electric. This joint incorporates the expansion feature, combined with some possibility of bend and the added value of the lock.

"These are ideas which in some form or other as proven most desirable, will surely be provided by all American manufacturers of pipe in the near future and they will, of course, tend to eliminate the hazards and increase the popularity of the solid welded lines. Up to the present, these welded lines have been compelled to meet a handicap of greater cost as well as difficulties of repairing when in service. The necessity for repair is ordinarily due to temperature changes, rather serious in the north, and strains due to irregular ground. Without some means of relieving these strains in sizes too large to give that serpentine wave which the pipe-liner calls 'slack,' they are apt to give trouble in the first year's operation at least.

"As against this, the competing coupled line has a weakness due to its inherent flexibility which must be controlled by an ample weight of covering earth. A washout of considerable length causes trouble in the coupled line that would not be experienced in the welded line."

WESTERN METAL EXHIBIT IN FEBRUARY

Several announcements have already been made concerning the National Western Metal and Machinery Exposition, which will be held in the Civic Auditorium, San Francisco, Calif., February 16-20, 1931, under the auspices of the American Society for Steel Treating. Many of the leading companies in the industry have already reserved space in the exhibit hall representing every line of metal manufacture and fabrication from needles to railroad locomotives. It is expected that there will be an attendance of approximately 50,000 visitors.

This will be the second great industrial show held in the West, the first one having been held in Los Angeles in January, 1929. Exhibitors will represent every phase of production, erection, fabrication, inspection, treatment, welding, assembly, and use of metals of all kinds. In all, over 70,000 sq. ft. of exhibit space will be occupied and many exhibits will show equipment in actual operation. Because of the great diversity of equipment shown, the interest on the part of the western industrial buyer is sure to be exceptional. Those managing the show point out that thousands of dollars in sales were made at the 1929 show in Los Angeles, although the primary purpose of the exposition was one of education.

The National Western Metal Congress, which will be held in connection with the exposition, is a great educational event in itself. It brings together those who are interested in the metal-using industries and gives them an opportunity to learn of and discuss the latest technical developments in these fields.

The twelve co-operating societies who will participate in the Congress are: American Chemical Society, American Institute of Electrical Engineers, American Institute of Mining and Metallurgical Engineers, American Petroleum Institute, Calif. Div.; American Society of Mechanical Engineers, American Society for Steel Treating, American Welding Society, Institute of Metals, National Purchasing Agents Association, Pacific Coast Electrical Association, Pacific Coast Gas Association, and Society of Automotive Engineers.

These societies will hold technical sessions, at which papers will be read covering all important methods and processes discovered or perfected in the metal world during the past two years. The Western chapters of these societies have a total membership of over 10,000.

Requests for information regarding the Congress and Exposition should be addressed to the American Society for Steel Treating, 7016 Euclid Ave., Cleveland, Ohio.

SYMPOSIUM ON STRUCTURAL WELDING

The Committee on Building Codes under the American Welding Society, New York Section, has announced a tentative program of a special meeting, to be held Nov. 18, at 7:45 p. m., presenting "the present status of structural welding throughout the United States, from the standpoint of application and regulation." The Engineering Societies Building, 33 West 39th St., will be the scene of a general symposium on structural welding, the plans of which promise an evening of especial importance to those interested in this field of welding.

The program, as tentatively arranged, provides a series of discussions on structural welding, beginning with a general explanation of the A. W. S. Structural Welding Code by Prof. F. P. McKibben, consulting engineer, General Electric Co., followed by an illustration of application of the code to a hypothetical multistory building, presumed to be erected within the municipal-building-code jurisdiction, by Gilbert D. Fish, consulting engineer, Westinghouse Electric & Manufacturing Co.

A period in the program will be devoted to an illustrated review of applied structural welding in buildings and bridges throughout the United States, to be presented by the American Bridge Co., Lincoln Electric Co., General Electric Co., Westinghouse Electric & Manufacturing Co., Linde Air Products Co., and others.

Reports are scheduled that will give current information on the progress of the adoption of structural welding by towns and cities in the United States, and on accrued welding tonnage in buildings and bridges in the United States.

The meeting is to be presided over by E. A. Doyle, president of the American Welding Society and past chairman of the Committee on Building Codes. Further details may be obtained from the American Welding Society Headquarters, 33 West 39th St., New York City.

A. I. S. C. RECOGNIZES IMPORTANCE OF WELDING PROGRESS

For several years past the American Institute of Steel Construction has been doing very effective work in expanding the market for steel. The reports made at the time of their recent annual meeting indicate continued progress and a variety of very interesting activities. There is also much indication that this organization recognizes the importance of welding as a factor in the development of additional markets for steel. In the annual report of Chas. A. Abbott, Executive Director of the Institute, particular mention is made of the growing trend toward the use of steel in residence construction, such construction involving a considerable amount of welding. Again, in the annual report of Lee H. Miller, Chief Engineer of the Institute, much attention is given to the growing use of the welded battledeck floor and also to the rapid growth of welding in the erection of steel structures in general. In addition to the attention paid to welding in these two reports, there were several papers which gave serious consideration to the process.

NEW YORK SHOW TO FEATURE PROGRESS IN POWER INDUSTRY

The eyes of power and mechanical engineers will be turned toward New York next month, when there will be held the Ninth National Exposition of Power and Mechanical Engineering in the Grand Central Palace. The coming show bids fair to be the equal of its predecessors in every respect, and it is anticipated further that some new records will be set. The products of more than 400 exhibitors will be carefully scanned by engineers and executives from many countries of the world, to see how the use of such products will help them to achieve more economy in operation and better quality in production.

Besides exhibits pertaining strictly to the economical generation of power, there will also be more than fifty manufacturers of tools and machine tools represented. Those who are interested in welding or other production operations in the manufacture of power equipment will find equipment pertaining to these processes on display and representatives on hand to explain and demonstrate the use of such devices and to answer questions and offer recommendations.

Many new machines and devices will be shown here for the first time in public, and those attending will have full opportunity to become acquainted with new methods, to make first-hand comparisons between competitive products, and to obtain such information as will enable them to select the most economical methods and equipment.

The exhibitors at the National Power Show, by which name the New York show is known, will have a message of economy and efficiency to tell, and ten times four hundred engineers and sales executives tell the story to the man who comes to the exposition to find out how they can assist him in the manufacture or marketing of his products—in other words, put money in his pocket.

Catechism on Welded Steel Buildings

Questions With Answers to Aid in Training Building Inspectors in the Art of Inspecting Electric-Arc Welding of Structural-Steel Operations

By Frank B. McKibben*

AS THE number of electric-arc-welded steel buildings increases, and as the size and height of these structures become greater, municipal building commissioners and chief building inspectors will find at the beginning of each inspector's career a need for the latter's instruction in the elementary and fundamental features of arc welding as applied to ordinary steel-building construction.

As an aid in this process the following direct questions and answers have been prepared by the writer after consultation with several welders, welding engineers, contractors, and building commissioners, and after having had experience in the design and construction of a number of welded structures varying from one to eighteen stories in height.

To experienced engineers these questions and some of the answers will appear of a very elementary nature; but it must be remembered that to the man who has not been in contact with welding, nor has been thinking in electrical terms, they give ample food for thought, simple though they are.

Question 1: What is electric-arc welding?

Answer: Welding in which two pieces of steel are melted together by the electric arc.

Question 2: What is the proper procedure for the contractor for erection of steel to follow in starting, for instance, a ten-story building?

Answer: The first tier of steel, after being erected, should be plumbed true to lines and levels, and all connections should be securely bolted or clamped before starting any welding. Each tier thereafter should be treated in the same manner.

Question 3: What is an electrode or welding wire used in electric-arc welding of steel building frames?

Answer: The electrode or welding wire is a short length of specially prepared steel wire about 12 to 18 in. long, and from ⅛ to ¼ in. in diameter, which is clamped in the electrode holder held in the hand of the operator and forms one terminal of the electric circuit. This wire is practically the same grade of steel as the steel parts to be welded.

Question 4: How important is the electrode?

Answer: Of the utmost importance. Care should be taken to use only the make and type specified.

Question 5: What are the base or parent metals?

Answer: The materials to be welded.

Question 6: What should be the condition of the base metals at the time of welding?

Answer: Clean and free from rust, dirt, grease, paint, or other foreign substances, except for a thin coating of linseed oil if the engineer has specified its use.

Question 7: How does the operator form the electric arc which melts the base metals together?

Answer: (*a*) One wire cable (lead) from the electric welding machine is fastened to the electrode holder held in the hand of the operator, while the other wire from the machine is attached to any part of the steel pieces to be welded. (*b*) The end of the welding wire is touched to the steel parts where the weld is to be made, and current flows. (*c*) The wire is then withdrawn about ⅛ or ¼ in. away and the electric arc is formed.

*Consulting Engineer, General Electric Co.

Question 8: Which welding lead, positive or negative, is ordinarily connected to the electrode holder when welding structural steel?

Answer: The negative.

Question 9: Does the electrode or welding wire last a long or a short time?

Answer: It lasts only a short time, because the heat of the arc melts it and it must be renewed when used down to two or three inches in length.

Question 10: What type of welding current, alternating or direct, is ordinarily supplied to the welding operator for use in structural-steel welding?

Answer: Direct current is almost exclusively used for arc welding structural steel.

Question 11: What diameters of electrodes are ordinarily used in structural-steel welding?

Answer: At present $\frac{3}{32}$ and $\frac{1}{8}$ in. diameters are generally used.

Question 12: What precautions must be taken by the operator while welding, or the inspector of welding while watching the welding process?

Answer: The arc should not be looked at without covering the face and neck with a helmet in which is a darkened glass for protecting the eyes against the arc. The welder should also wear gloves to protect his hands.

Question 13: Which is preferable, a short arc or a long arc?

Answer: A short arc, because it makes a purer weld, gives better fusion and penetration, and causes less spattering of the molten metal.

Question 14: What are the names of the two small dials or gages found on most welding machines?

Answer: One is the voltmeter; the other is the ammeter.

Question 15: What does the voltmeter on the electric-welding machine indicate?

Answer: The voltmeter indicates the voltage, that is, shows the number of volts, or electrical pressure; somewhat as a water-pressure gage shows the water pressure in a pipe line.

Question 16: What does the ammeter on the electric-welding machine indicate?

Answer: The ammeter indicates the amperage, that is, shows the number of amperes, or quantity of electric current flowing; somewhat as a water meter records the quantity or amount of water flowing through a pipe.

Question 17: Does the needle on the voltmeter record the same amount all the time?

Answer: No. When the welding operator is welding, the needle on the voltmeter records a small number of volts. When he is not welding and the machine is running idle the needle records a larger number of volts.

Question 18: Does the needle on the ammeter record the same amount all the time?

Answer: No. When the welding operator is welding, the needle on the ammeter records a large number of amperes. When he is not welding and the machine is running idle the needle stands at zero.

Question 19: Is there any way by which the welding operator can regulate the amount of current, that is, change the

amperage, in order to get more or less current as required for welds of varying sizes?

Answer: Yes. On each machine is a small crank or similar device which can be turned in such a way as to furnish more or less current, and therefore more or less heat, to the welder.

Question 20: Does a welding operator in welding thick steel require more current, that is, more amperes, that is, more heat, than when he is welding thin steel?

Answer: Yes. The thicker the steel parts to be welded, the greater is the amount of heat required, and the current must be greater than when welding thin steels. The thicker the steel, the greater should be the amperage.

Question 21: How would you identify each welder's work if several were working on one job at the same time?

Answer: Require each man to use a die or stencil for marking the steel at each weld he makes.

Question 22: Name the two kinds of welded joints that are sometimes used to test welding operators to find out whether they can do good welding.

Answer: (*a*) Butt welds, and (*b*) fillet welds.

Question 23: How is a butt-welded joint made?

Answer: For thin plates, say ¼ in. thick or less, by placing the edges of the plates almost but not quite together and melting them together by the arc. For thicker plates, before applying the arc, the edges to be welded should be beveled.

Question 24: How is a fillet weld made?

Answer: Fillet welds are used where one plate to be welded is lapped over the other, and the two joined together by depositing with the arc a mass of metal against the edge of one plate and against the side of the other, forming a fillet.

Question 25: If a fillet were sawed across so as to show its cross-section, what would be the shape of this cross-section and about how large?

Answer: The cross-section of a fillet is generally a triangle. The base of the triangle is ordinarily equal to its height and is about ¼ or ⅜ or ½ or ⅝ in.

Question 26: How would you describe the size of a fillet which has a triangular cross-section with base and height of the triangle each ⅜ in. and the fillet extends 6 in. along the edge of the steel plate?

Answer: This would be a ⅜-in. fillet, 6 in. long.

Question 27: In welding steel building frames made up of beams, columns, and other similar structural shapes, what kinds of welds are mostly used?

Answer: Triangular fillet welds are nearly always used and are generally of ⅜-in. size; although they may be specified by the engineer as small as ¼ in. and as large as ⅝ in. or sometimes even ¾ in.

Question 28: For carrying ordinary floor loads in buildings, what is the safe load in shear allowed by building codes for a triangular fillet weld of ⅜-in. size and 1 in. long? ½-in. size and 1 in. long? ⅝-in. size and 1 in. long?

Answer: For ⅜-in. fillet 1 in. long, 3,000 lb. For ½-in. fillet 1 in. long, 4,000 lb. For ⅝-in. fillet 1 in. long, 5,000 lb.

Question 29: Is a fillet of good, smooth appearance, free from small gas holes, better than one with a very rough surface and badly pitted with gas holes?

Answer: Yes. Smoothness of surface and freedom from gas holes indicate better workmanship and stronger welds.

Question 30: What precautions should be taken to insure good welds?

Answer: (*a*) Employ only welders who have satisfactorily passed qualification tests to show their skill in welding. (*b*) From time to time during progress of the work, in order to maintain a high standard, require each welder to make additional tests. (*c*) See that the welding wire conforms to the requirements of the specifications and shows good welding qualities. (*d*) Inspect the welds while being made to see that the operator is holding a short, steady arc and using the proper amount of current. (*e*) Examine the finished welds and accept only those having a smooth appearance, free from gas holes or porous places; see that the crater shows that the weld has properly penetrated the base metals; see that the edges of the deposited metal are sharp and indicate good penetration into the base metals.

Question 31: About what current should be recorded on an ammeter of a welding machine when the welding operator is depositing a ⅜-in. fillet? a ¼-in. fillet?

Answer: For depositing a ⅜-in. triangular fillet, a current of from 175 to 200 amperes should be indicated on the ammeter. For a ¼-in. fillet, a current of from 150 to 160 amperes should be indicated.

Question 32: Approximately what amount of current should be used with $\frac{5}{32}$-in. diameter electrodes? with $\frac{3}{16}$-in. diameter electrodes?

Answer: This depends somewhat on the thickness of steel to be welded, but generally 150-200 amperes for $\frac{5}{32}$-in. diameter electrodes and 175-225 amperes for $\frac{3}{16}$-in. diameter.

Question 33: How should a condemned weld be removed in order to permit the joint to be rewelded?

Answer: The weld metal should be cut out either with a compressed-air tool or by hand.

Question 34: Are some kinds of steel floor joists welded?

Answer: Yes. Some are made in factories by welding steel parts together.

Question 35: By what methods are welded steel floor joists connected to the steel floor beams which support them in the building?

Answer: Where welded steel floor joists are used, they are connected to the steel floor beams by bolts, clamps, or small fillet welds.

MILLION-DOLLAR BUILDING TO BE ENTIRELY ARC WELDED

Plans for a new manufacturing building to cost $1,000,000, to be erected immediately at the Pittsfield, Mass., plant of the General Electric Co., have been announced by E. A. Wagner, general manager of the works. The structure will be devoted to the exclusive manufacture of transformer tanks and when completed will be the largest transformer tank shop in the world. It will be more than 550 ft. long, 150 ft. wide and 70 ft. high and will be all welded. Construction will take nearly four months.

Present construction plans provide that the entire building be built of steel and glass on a concrete foundation. No brick or timber will be used. More than 1,500 tons of structural steel will be utilized. There will be 32,000 panes of glass, all set in steel sash. Welded steel pilasters will be used instead of the conventional brick type. The roof will be a welded blanket of insulated steel, covered with a waterproof compound. The proposed building is quite unlike anything ever planned in the manufacturing-building line.

In connection with the main building there will also be an extension, 350 ft. long by 27 ft. wide, to be used for the various manufacturing and production offices. This will be similar to the main building with respect to construction details.

It is expected the new building will be adequate to care for large transformer needs until 1935. Every operation in the making of huge steel tanks will be carried out under the one roof. These include fabrication, machining, testing, sandblasting, painting, welding, baking, etc. More than 93,000 sq. ft. of floor space will be added to the area manufacturing space now available in the Pittsfield works.

General Railroad Welding*

Fusion Welding Has Long Been a Handy Tool in the Repair and Maintenance Departments, and Is Invaluable in Making Manifolds, Tanks, Jigs, Tools, Etc.

By G. H. Gjertsen†

I BELIEVE it is conservative to say that in no other industry today has fusion welding found a more important or a more extended field of application than that to which it is now being used in the maintenance in general on railroad equipment.

Railroad equipment pictured in the minds of a great many individuals, I believe, may be defined as a powerful passenger locomotive pulling a train of handsome passenger cars over rails at a high rate of speed, with the engineer and fireman each occupying their respective seats in the cab of the locomotive, their principal duties being to blow the whistle and ring the bell to warn of the approaching train. This vision, however, is only a surface view of the railroad industry and a very small part of this big machine, as it may be referred to.

Only those that are actually engaged or responsible in the work of keeping this industry in motion can realize the millions of tons of iron, steel, brass and other metals required to make up the millions of parts necessary in the mechanical operation of a modern railroad. To further emphasize this point, we may in round figures picture a railroad track 400,000 miles long. Place on this track 59,000 locomotives pulling a train of 2,400,000 freight cars and 57,000 passenger cars and it will give you a fair idea of what is termed the rolling stock of the railroads in these United States. We may add to this 50,000 stations and terminals, yards, signals, roundhouses, machine shops, water supply, power plants, elevators, coal docks, coal pits, and other items also required in the general makeup of this super-machine.

What part does fusion welding play and to what extent is it now being used in the general construction and maintenance of this tremendous display? The field may be termed as unlimited. That the welding processes are already recognized and filling a very important place in the efficient and economical maintenance of railroad equipment cannot be questioned. The flash of the electric arc and hissing flame of the oxy-acetylene torch have become most common, one process or another being in evidence at nearly every turn.

Its place may begin in the track department, building up the worn surface on frogs, switch-points and rail-ends. It has found a place in the bonding of rails, making a perfect contact for electric current to flow. It welds together or builds up the smallest to the largest castings on the powerful locomotives. It reclaims thousands of castings and parts on freight and passenger cars.

From the coal docks and power houses to the section foreman's speeder and hand-car, there is hardly a piece of equipment today where the welding process has not become of foremost value in maintaining it in service.

Fields of Application of the Various Welding Processes

Of the several recognized practices of welding, our discussion is confined principally to oxy-acetylene welding, which is of widest general application in railroad work. There is a recognized field for thermit and electric-arc welding; and no definite limit can be set where either can be used with success, provided the requirements of safety and economy are complied with. If equal results can be obtained, it is, of course, desired to use the process with which the work can be performed most economically and to the best advantage; but the general run of castings and parts made of cast iron, brass, bronze and aluminum, are welded with oxy-acetylene, as well as a large percentage of the steel parts.

Of the major welding operations on locomotives, possibly the most pronounced or outstanding application is in the welding of fire-box sheets. The practice of riveting seams, or riveting patches, in the fire-box has almost universally been discarded as far superior results are now being obtained by welding.

The advantage of the welded seam over the riveted type of seam is that it requires no further maintenance and is a perfect joint, free from leaks, such as were constantly developing in the riveted fire-box. The loss of fuel from steam leaks in the riveted seams was considered a very important item and therefore made the riveted seam very undesirable.

Repairing of Frame Sections

Some of the largest and most difficult problems in railroad welding are encountered in the welding of broken or cracked locomotive cylinders. As most of the cylinders are of cast iron, careful preheating is required to accomplish the desired results. This work, in most cases, can be handled without removing the cylinder from the locomotive, by building a suitable furnace of firebrick around the cylinder and using charcoal, or other fuel, for preheating. Careful preparation is very important in this work as well as thorough knowledge and skill in applying the weld. Very satisfactory results are obtained with the oxy-acetylene process on this work, and the savings effected by such repairs, considered in terms of material and of locomotives returned to service with a minimum of delay, are of the highest value.

The welding of locomotive frames may also be classed among the major and important welding operations on locomotive parts. The size of the frame, location of the break as well, and other conditions should, of course, be considered when deciding what welding process to use, where adequate equipment and competent welders are at hand and the work can be skillfully performed.

On heavy sections, in particular, the success of the work, as well as the cost, will vary materially with the skill with which the weld is applied. The advantage, convenience, and saving in time and labor made possible by fusion welding on frames can hardly be overestimated. Considering the size of present-day locomotives, the old method of removing the frame and forge-welding it in the blacksmith shop would not only be an expensive operation but quite impossible to handle.

Other frame sections, such as on engine trucks, trailer trucks, and tank trucks, are likewise welded, the preparation and handling being much the same as with locomotive frames.

The bronze welding of frames has received much attention on some railroads; and in many cases this has proved to be a successful and economical practice, especially where the fracture is so located as to make difficult sufficient expansion for a steel weld.

Welding on driving-wheel centers consists mostly of welding broken spokes. In welding spokes, the tire should be removed from the wheel center and proper provision made for contraction either by cutting the rim and wedging apart, or heating the rim and adjacent spokes and thereby expanding or spreading apart the sections to be welded before starting the weld.

When wheels become out of round, or under size, the outside circumference or rim is built up, after which the wheel

*Read before the 31st Annual Convention of the International Acetylene Association, Chicago, Ill., Nov. 12 to 14, 1930.

†General Foreman, Northern Pacific Railway Co., South Tacoma, Wash.

is machined or finished to size again by turning. The building-up operation of this nature is done with automatic electric equipment, with the wheels revolving in a wheel lathe during the application. This operation being one of merely building up the surface, where the strength of the weld is not involved, electric welding may be considered logical.

The building up of worn piston heads with the oxy-acetylene process using manganese-bronze welding rod is also common practice on most railroads. Properly applied, with due regard for the economical expenditure of time and adding material, this operation offers outstanding economies, and it is often considered that the built-up head has a longer life than the original head.

The general reclamation of the small castings and parts in the locomotive and car departments opens a field that would require volumes to cover, which space in this paper would not permit. However, I will mention briefly some of the items.

Repairs to Shop Machinery.—The use of welding in the repair and general maintenance of shop machinery has become of foremost value. Repairs are made to machinery, castings, and parts that could not be accomplished by other methods, thereby putting disabled equipment back into service in a comparatively short time and at a fraction of the cost of purchasing new parts and, further, avoiding long delays in getting the equipment back in service. The process has also made possible the construction and fabricating of many conveniences and facilities that otherwise would not be provided. Special tools and particularly jigs of various description are easily constructed with the use of the welding process, which materially expedites work and is highly valuable towards efficient and economical shop operations.

Pipe Welding.—The welding of pipe in railroad work, as in many other industries, has opened up a vast and extended field of application. Pipe welding, as here referred to, naturally includes the making up of manifolds, bends, special fittings, etc., and practically eliminates other types of fittings, such as otherwise would be required.

Vats and Cisterns, Tank Welding.—Among other requirements in the operation of railroad systems are storage tanks, cisterns, and vats for water supply, fuel and lubricating oils, chemicals, and other liquids and gases. These are now practically all of welded constructions.

Hard Surfacing.—In the last few years considerable progress has been made in the development of hard-surfacing, or hard-facing, welding rods. Although the railroads are perhaps accustomed to regard the rapid wear of metal parts as inevitable, there is no doubt that the maintenance of railroad equipment offers a wide field for hard-surfacing applications, and we may confidently expect the growth of oxy-acetylene welding in this direction.

Car Departments.—The major castings and parts that are repaired by welding are truck sides, bolsters, transoms, car axles, center plates, air reservoirs, air-brake cylinders, knuckles, etc. Cracks that are welded in these parts are reinforced by building up over the weld. A standard practice on many roads when welding tension members of truck sides is to reinforce the whole area in tension with a plate or strap $\frac{1}{2}$x4 in. This plate is welded on the sides and ends around all the edges of the plate. All castings of this nature that are welded are annealed afterward. An interesting example of the convenience and economy of oxy-acetylene welding and cutting occurs in this connection. At a number of car shops the reclamation of truck sides depended upon the construction of these furnaces with a minimum of expenditure. By means of the cutting and welding torches these furnaces were built largely out of scrap material, and the cost was therefore but a small part of the original estimate. The building-up of end collars on car axles is another operation in which welding is used with economy. Welding on air reservoirs and air-brake cylinders consists mostly of welding or building on broken or worn lugs and flanges. There are smaller castings too numerous to mention at this time that are welded very economically.

Cutting Applications.—The oxy-acetylene cutting torch is very widely used in the locomotive department, both in fitting up new work and for dismantling. In the boiler shop the cutting and fitting up of sheets for the boilers, fire-box, ash pans, etc. is largely done with the torch. In dismantling, it is common practice to cut out all stay bolts, rivets, and sheets in fire boxes. In the car department it is used for stripping old cars and also fabricating new parts for steel as well as wooden cars. The bridge and building departments find a field on frame structures, cutting cord bolts, offensive drift bolts, sway brace spikes, etc. The water department uses it for the shaping of pipe, cutting out defective parts, and replacements. The maintenance-of-way department has found a large field for cutting off track bolts for rail renewals that has a great advantage over the old chisel and spike maul method, and eliminates the hazard of personal injury. The torch is used for the cropping of third-class rail for yards. In fact, the numerous uses of the cutting torch in the mechanical world are almost impossible to comprehend.

Mechanically operated cutting torches are rapidly being adopted for cutting various shapes out of plates and billets, and are replacing forging operations in the forge shop to a considerable extent. A saving in time and material is almost always the result in these applications, as the forging and machining operations are either eliminated or greatly reduced. These machines are also used for cutting shapes out of rolled steel for fabricating parts that replace castings, with a resultant saving in production costs, an increase in strength, and a reduction in weight.

Importance of Detailed Records

In calculating the economies effected by welding it is necessary to keep extensive records at least for a sufficient period of time to strike a fair average of the varying conditions under which the work comes in and is executed, as well as from the service rendered. Those responsible for the application must be in position to know definitely the results obtained in service in order that the developing of this work may be handled wisely and to best advantage.

The inspection of welds must necessarily be largely a matter of observation, both of the welder while he is at work and of the general surface appearance of the weld, if the work is performed by welders known to be competent. Other tests, except in cases of pressure vessels, depend upon the destruction of the weld and are therefore inapplicable.

The ability of welders assigned to important work should be further ascertained by sample welds submitted to laboratory tests. Such tests must also necessarily be made periodically to check welding material, and can therefore serve a double purpose.

In conclusion I should like to say that in the next few years we will see many changes that could never have been brought about, had it not been for the welding process.

WELDED PIPE OFFERS MANY ADVANTAGES FOR GAS AND OIL LINES

Electrically welded pipe has other merits than just cheapness for use in cross-country gas and oil mains. Uniform wall thickness and light weight are other advantages. Moreover, not until pipe was welded electrically could pipe lines get pipe free from scale cheaply enough, according to John W. Love, writing in the *Cleveland Plain Dealer* of August 22nd. Any scale present in the pipe would come through in the gasoline, and pipe made by hot rolling had the scale.

It is a well-known story of how the A. O. Smith Corp., of Milwaukee, Wis., quite some time ago got the jump on other manufacturers of large-size steel pipe by producing long lengths of pipe by a special electric-welding method, and as

a result did the bulk of the business in the field of steel pipe manufacture, and this was a very considerable amount as oil-refining and pipe-line companies were expanding their business rapidly during this period and many thousands of miles of large-diameter pipe lines were being laid.

But the other pipe manufacturers have refused to play second fiddle if they can help it, and their research departments have tackled this problem of the electric welding of pipe. The Republic Steel Corp. are now making welded steel pipe by their own process, and the first of the large-diameter electrically welded pipe to be made by the Youngstown Sheet & Tube Co. was some weeks ago run through their new mill at Briar Hill. The National Tube Co. has been in production for quite some time on electrically welded pipe in the smaller sizes.

The Republic Steel Corp.'s process of pipe manufacture is unusual in that the resistance method of welding is employed, the process being covered by patents issued to Gustav Johnson in 1921, which were acquired by Steel & Tubes, Inc., of Cleveland, Ohio, which company is now a part of the Republic Steel Corp.

The method of manufacture is explained in an article in the August 21st issue of *The Oil and Gas Journal*, by John W. Hill, of the Publicity Department of the Republic Steel Corp., who also outlines some of the characteristics of pipe made by this method. Universal-mill plate, known as "skelp," is cut so the edges are parallel and then all scale and oxide removed by pickling or sandblasting. The skelp is then rolled into the form of pipe of approximately the completed shape, and then passed onto the welding stand. The edges are pinched by current-carrying electrodes in the form of rollers, and the current generates sufficient heat to fuse the edges of the plate together into one continuous seam. The pipe then enters a series of sizing rolls and at the same time the welding butt is removed, producing a perfectly smooth surface inside and out. The pipe is then put through a set of roller straighteners, following which the ends are cropped off and the pipe is cut to the lengths desired. The ends then are either threaded or beveled for field welding. Each length of pipe is inspected thoroughly and given a hydraulic test. The welded seam is said to be stronger than the pipe metal itself.

For any given internal pressure, the use of electrically welded pipe allows a lighter-weight pipe with thinner walls. The reason for this is given by Mr. Hill as follows:

"Pipe made by the fire-weld process cannot be manufactured with carbon content higher than 0.12 of one per cent, which gives a minimum tensile strength of about 45,000 lb. per sq. in. Pipe made by the electric-welding process can be produced up to 0.50 of one per cent, with a minimum tensile strength of not less than 80,000 lb. per sq. in. Because of the fact that the pipe is formed cold from steel made in a strip mill, there is practically no variation in the wall thickness of electric-weld pipe.

"These features are important to the engineer designing a pipe line because it is now possible to employ lighter weights of pipe to withstand high working pressures. For example, on 16-in. pipe made by the fire-weld process for 800-lb. working pressure, it would be necessary to use lap-weld pipe, ½ in. thick, weighing 82.771 lb. per ft. Electric-weld pipe can be produced in ¼-in. wall weighing 42.053 lb. per ft. and standing 800-lb. working pressure, or a difference of 40¾ lb. on each foot of pipe.

"This is equivalent to a saving in steel of 157 tons per mile, amounting to approximately $11,000. The saving in freight on a mile of this 16-in. electric-weld pipe, when shipped to the gas fields in the southwest from northern steel-producing centers, would amount to $2,500.

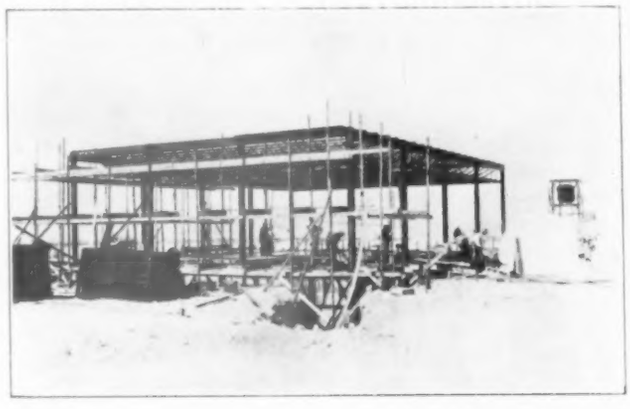
"Instead of the 20-ft. lengths of the older types of pipe, it is possible to produce electric-welded pipe in any length, but the most practical from the standpoint of railroad transportation and handling is from 40 to 46 ft. These longer lengths constitute a further economy in laying as only 130 or 140 joints are required to the mile against 260 to 300 for the short-length heavier pipe."

NEVADA NOW HAS A WELDED BUILDING

The Bell Telephone Co. of Nevada recently completed the erection of a toll building at Las Vegas, Nev., which is the first structure in that state to be erected by the use of the electric-arc-welding process.

This building, and its accompanying water tower, was erected under the supervision of G. R. Morrison, building engineer for the Southern California Telephone Co. The structural steel was fabricated and erected by the Pacific Iron & Steel Co. of Los Angeles, Calif., using Lincoln "Stable Arc" welders. The general contract for the job was let to Storm & Mahoney, of Pomona, Calif.

The Las Vegas Toll Building is located approximately 300 miles northeast of Los Angeles. It is a one-story building,



Welded Framework of Telephone Toll Building.

66 ft. long and 50 ft. wide, and involved the erection of approximately 65,000 lb. of steel in its construction.

Details of construction of the steel may be seen in the illustration. The vertical columns are 8-in. H-beams, and extend from the basement to the roof. There are no interior supports in the building above the ground level. Vertical H-beams run from the basement to the ground level to support the floor. The floor is constructed of steel beams and slab. The roof is suspended on trusses which extend the full width of the building. The entire steel work was arc welded into place.

Steel nailing studs of light-gage channel sections were arc welded into the walls. The finished walls were completed by nailing plaster board to the steel studs and plastering over it.

This telephone station, which is located in desert country, also includes a 3,000-gallon water tower, as shown in the accompanying photograph. This structure stands 30 ft. high and is fabricated entirely of arc-welded steel.

BUFFALO MEETING DEVOTED TO WELDING OF BUILDINGS

The Western New York Section of the American Welding Society held its regular monthly meeting at the Statler Hotel, Buffalo, on Nov. 10th. This meeting was addressed by D. H. Deyoe, of the Industrial Engineering department of the General Electric Co., of Schenectady, N. Y. The general subject related to the electric welding of structural steel and battledeck steel floors, and included a brief outline of recent developments in the application of arc welding in general. Lantern slides and moving pictures were shown of large welded buildings and of a battledeck steel floor.

CLEVELAND SECTION, A. W. S., VISITS STEEL AND WIRE MILLS

Many members of the Cleveland Section, American Welding Society, participated in the Cleveland Engineering Society's inspection trip through the American Steel & Wire Co. plants at Cleveland on October 28th.

The party was taken by a special train from the B. & O. depot to the Central Furnace plant, where the actual tapping of the blast furnace was observed at close range. After seeing the pour, the plant as a whole was inspected. The next stop was at the Newburg plant, where a chicken dinner was served to the group.

This inspection trip gave the group an opportunity to see a hot strip mill, rod mill, billet mill, cold-rolled mills, and wire-drawing departments. Six hundred and eighteen men turned out for this trip. Joseph H. Gepfert, of the Reeves Pulley Co., was chairman of the committee on arrangements.

BOOKLET ON STRUCTURAL WELDING

A paper on "Welding: Including Some Applications to Large Structures," by Major James Caldwell, read before the Institution of Structural Engineers (British) on February 13, 1930, has been reprinted in booklet form by the author. The paper consists of three parts, which include a number of appendices, and pertains to British, Continental, and American practice in structural-steel welding.

The first part is intended to give the structural engineer information on the various welding processes, pointing out their fundamental differences and fields of application; also equipment used and preparation of the work for welding.

Specific fields of application are discussed in part two, including the construction of ships, boilers, steam pipe-lines, railways and tramways, buildings, masts and towers, concrete reinforcement, tanks, machines, and repairs of various sorts. Various types of joints are described, and methods of clamping elements for welding are given consideration.

The appendices have reference to an arc-welded barge, a welded bridge, certain welded buildings and other structures, joint design, and results of tests of welded specimens and welded structural joints. The discussion following the paper is also included.

The paper is replete with a large number of interesting photographs and diagrams.

ELEVATOR MANUFACTURERS HEAR ABOUT WELDING

At a meeting of the Elevator Manufacturers' Association, held at the Palmer House, Chicago, October 30th, a paper on "Arc Welding in the Elevator Industry" was read by E. N. Baldwin, of the Westinghouse Electric Elevator Co. Mr. Baldwin called attention to the widespread use of arc welding throughout the metal-working industries, and showed how the process is being used successfully in the construction of many parts of heavy machinery which were formerly made of castings. He gave some interesting examples of applications in the construction of elevators, illustrating some of the more important jobs.

HEAT TREATING COURSE IN CHICAGO

The Engineering Extension Division of the American Society for Steel Treating, in co-operation with the Engineering Extension Division of Purdue University, Lafayette, Ind., has announced a series of practical illustrated lectures on steel and its treatment, by John F. Keller, of Purdue University. These lectures, which began on November 11th, will be held every Tuesday from 7 to 9 p. m. for six weeks in the auditorium of the Peoples Gas Building, 122 S. Michigan Ave., Chicago. The course is under the management of the Chicago Chapter of the American Society for Steel Treating. This series of lectures has been developed from several years' contact with the metal problems of the industries of this country, and is arranged in a simple and understandable form. Mr. Keller has demonstrated his ability to arouse interest and attention among those who enroll in his classes, as is evidenced by an analysis of the attendance record of the past few years, which exceeds 80% of 57,000 men enrolled from the State of Indiana and over 90% for the remainder of the country. His lectures are illustrated with lantern slides and sufficient time is given at each meeting to discuss individual problems. An enrollment fee of $10 is charged for the course.

G. P. A. MOVES ITS HEADQUARTERS

The headquarters of the Gas Products Association have been moved from 608 S. Dearborn St., Chicago, to 240 E. Ontario St., Chicago. C. T. Price recently resigned as commissioner and secretary of the association and is succeeded by Earl Evleth. Mrs. Kathryn Mims has been appointed executive secretary and A. C. Krein treasurer.

A CORRECTION

Through a clerical error, the acetylene generators used on the pipe-line job constructed by W. S. Bibb, illustrated and described in the October issue of *The Welding Engineer* in the article entitled "Tractors Speed Up Pipe-Line Welding", were stated to be Oliver equipment. Instead, these are Imperial generators, made by The Imperial Brass Manufacturing Co., of Chicago, many of whose Type M generators are being used in the field for construction of oil and gas pipe lines.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of The Welding Engineer, published monthly at Chicago, Illinois, for October 1st, 1930.

State of Illinois, County of Cook, ss.

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared H. S. Card, who, having been duly sworn according to law, deposes and says that he is the Editor of The Welding Engineer, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, G. H. Mackenzie, Chicago, Illinois; Editor, H. S. Card, Chicago, Illinois; Managing Editor, H. S. Card, Chicago, Illinois; Business Manager, H. S. Card, Chicago, Illinois.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) The Welding Engineer Publishing Co., 608 S. Dearborn St., Chicago, Ill.; G. H. Mackenzie, 7321 So. Shore Drive, Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is ..... (This information is required from daily publications only.)

H. S. Card, Editor.

Sworn to and subscribed before me this 1st day of October, 1930.

(Seal.) G. W. Tyler.

(My commission expires June 25, 1932.)

Hints for the Welder

WHEN YOU FIND a new way to do a hard job, or finish a particularly interesting weld, can you describe how the work was done? . . . . . Have you learned some little stunt every welder ought to know? . . . . . Write to us about these things . . . . . This department helps you welders to help each other. Write up your ideas any old way and just make rough pencil sketches . . . . We'll fix them up for publication.

A WELDED POSEY

"Say it With Flowers" must have prompted this welder to apply his art in designing a sunflower made entirely with a welding torch—and his artistic eye. This unusual

A Welded Sunflower That Never Withers.

piece of welding and cutting was done by an employee of the T. B. Slick Oil Co., of Earlsboro, Okla. The material used was ordinary boiler sheet metal.

A WHALE OF A WELDING JOB

A very interesting and unusual welding job is reported to have been recently completed near Hollywood, Calif., in the designing and building of an all-welded mechanical whale, which is used in scenes of a recent motion-picture production. The job, which required a score or more or welders and was several weeks in the course of completion, was done for a local motion-picture producer by a Los Angeler welding contractor.

The total length of the whale is about 85 ft. by about 28 ft. in diameter. It was fabricated of 1½x1½x⅛-in. angle iron and 1½x⅛-in. strip iron. All the welding was by electric arc. The total cost of this "monster of the seas" is reported to have been over $40,000.

Covering of the whale for the completed job was done by stretching wire netting over the metal lath of the framework and covering with Bitutect, which, by its color, gave the body its natural "whale color."

The movement of the whale was cleverly arranged by working the whole body on an off-center axle. It was placed on three railroad trucks, which, by raising and lowering, gave a swimming movement effect which was very realistic. Added realism was attained in the working of the jaw and also the tail, on hinges operated by hydraulic jacks. A tank attached underneath the tail and filled with four tons of scrap iron, together with an arrangement of hydraulic jacks, furnished the means of raising and lowering the ends for the desired motion. These hydraulic jacks were specially made, and were also of all-welded construction.

Construction of the whale was, of course, done in "dry dock," in a large tank or lake about 150 ft. long, provided for the purpose. When all was in readiness, the water was turned in for the "maneuvers" and "shooting" of the different scenes.

This unusual specimen of mechanical ingenuity for "fooling the public," made possible through the art of welding, has created much comment and amusement among hundreds of welders in the vicinity of Los Angeles.

WELDED FLOATING DECKS FOR STORAGE TANKS

The Gallagher Co., a subsidiary of the Consolidated Steel Co., of Los Angeles, Calif., is manufacturing welded metal floating decks, or pontoon roofs, for large tanks used for storing oil, gasoline and other volatile liquids.

The upper photograph shows piles of these pontoons

A Yard Full of Welded Pontoons for Floating Decks, and a Close-Up View of One of the Pontoons.

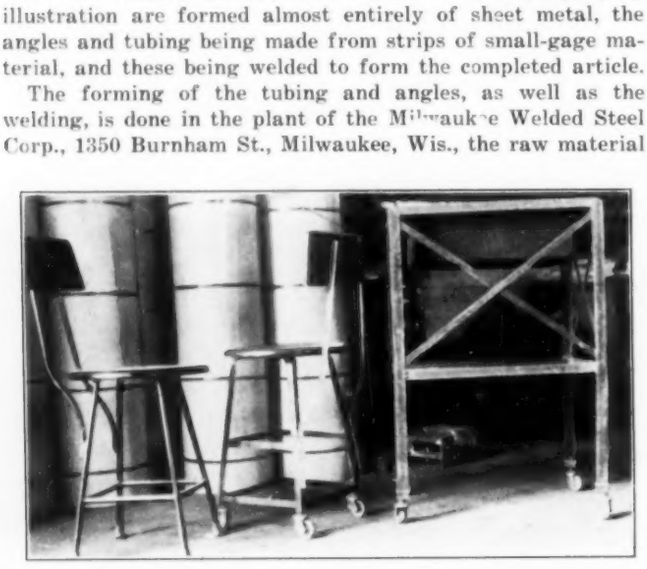
ready for assembly, these being of all-welded construction and of 14-gage sheet metal. There are approximately 30 ft. of arc-welding around the edges of each of these pontoons (depending upon its size), besides the welding of the corners, which are gas welded. In extra-large tanks there are often as many as 200 of these pontoons in a single roof.

The lower photograph is a close-up view of one of the pontoons, in behind which is also seen the center "wells" or sections to which the outer odd-shaped pontoons are fastened when putting the deck together. These floating sections are fastened together by bolts instead of being welded. The reason for this is that leaks often occur and the leaky section can thus be removed for repair without the hazard of fire or damage to the other sections.

WELDING SHOP TRANSFORMS SHEET METAL INTO USEFUL ARTICLES

The two chairs and the table shown in the accompanying illustration are formed almost entirely of sheet metal, the angles and tubing being made from strips of small-gage material, and these being welded to form the completed article.

The forming of the tubing and angles, as well as the welding, is done in the plant of the Milwaukee Welded Steel Corp., 1350 Burnham St., Milwaukee, Wis., the raw material



Welded Furniture Made of Sheet-Metal Angles and Tubes.

being sheet steel. While some of these articles are being used within the plant itself, many have been fabricated on order for other shops and factories.

The chair shown on the left is made of open-seam tubing of $\frac{5}{8}$-in. outside diameter, formed from 16-gage sheet. The seat and back rest are of wood, the rest of the chair being welded metal. The tubing forming the support for the back rest is welded to two legs of the chair.

The other chair also is a welded product, the legs and the support for the back rest consisting of $\frac{3}{4}$-in. angles formed from strips of $\frac{1}{8}$-in. sheet, and the braces welded to the legs being small strips cut from the same gage of material. The tops of the angles forming the legs are flattened out and bent, thus making a rest for the wooden seat, which is held in place with screws. The back rest is bolted to the legs instead of being welded, so it can be removed when it is desired to use the chair as a stool or a small table. The lugs that receive the castors are welded into the corners of the angles.

The finished chairs—frame, seat, and back rest—are given a coat of lacquer and are very neat and attractive.

The table that is shown also has legs of angle section, braced by strips cut from sheets. The drawer, located on the farther side, is all welded, as is also the shelf just below the cross braces.

RECLAIMING CAST-STEEL LADLES

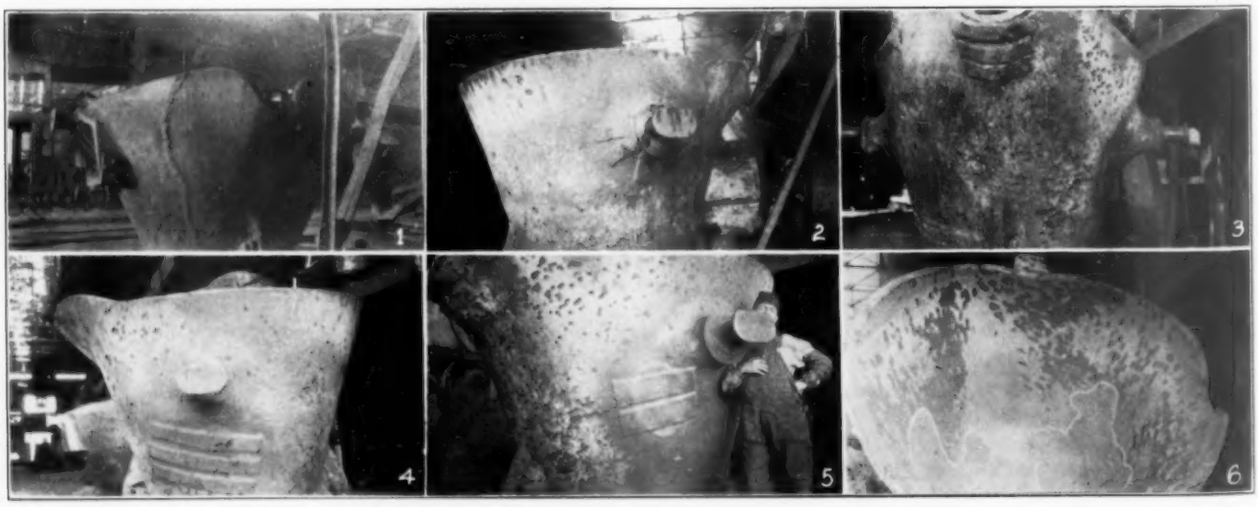
By Fred A. Cosgro

The large ladles used in copper smelting undergo severe service, resulting frequently in cracks and breaks and in burning holes through the ladle. A number of such ladles have been repaired by us and put back into service through the arc-welding method. Cracks are V'd out and welded and then reinforced with welded straps, and holes are filled by means of welded patches. Also, hard facing has been applied with success to the inner surface of the ladle to resist erosion and chemical action of the hot metal on the cast steel of the ladle.

Fig. 1 shows a cast-steel bullion ladle with a crack extending up the side. The crack was welded with $\frac{5}{32}$-in. low-carbon-steel electrode; but owing to the severe strains met in service, it failed. The procedure for the proper repair of cracks so the welds will withstand these severe strains will be outlined later on.

Fig. 2 shows a lug, or trunnion, of a ladle, over which fits the crane bail. These lugs were cracked half way through, and it would have required a great deal of heavy chamfering and days of hard work to weld them both. So six $\frac{1}{2}$-in. boiler-plate patches were arc welded on the outside. These gave the lugs the necessary strength and allowed inspection for cracks, as well as saving considerable time. This repaired ladle has been in service for more than a year and is still in first-class condition.

A repair of a cracked pouring lip is shown in Fig. 3. This



Welding Is an Inexpensive Way of Repairing Expensive Ladles.

location is a good test for a weld, as it gets hammered around, bumped here and there, and the weld must stand all the strain. Even the patches are dented up, as the illustration shows. This ladle weighs 20 tons.

Fig. 4 shows a large patch in a matte ladle. More than twenty 50-lb. boxes of wire were used on this job. This ladle was almost brand new and cost about $2,000, and in the

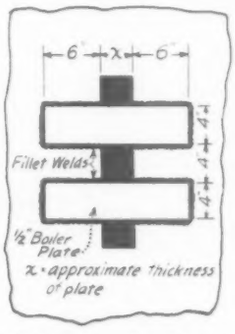


Fig. 7 (Left). Repair Made With Welded Reinforcing Straps. Fig. 8 (Right). Detail of Straps for Strengthening Welds.

short time it had been in service a hole was burnt through it. The patched ladle as shown has been in service since last January 22nd, and today it is as good as new.

Fig. 5 is another matte ladle that had a hole burnt through it. The patch in this case was somewhat smaller than that in Fig. 4.

A hard-facing job is shown in Fig. 6. This ladle was burnt thin all around the outline chalk mark. More than 400 lb. of hard-facing metal was used in making the repair. Hard-facing material is ideal for the building up of the inside surfaces of ladles handling matte, as it stops all chemical reaction between the matte and the steel of the ladle. In applying hard-facing, a bead should first be run around the edges of the area.

In the repairing of cracks in these ladles, the following procedure was followed:

First, the cracks are chamfered out to a double-V that is symmetrical with respect to the center. Then by means of a chipping hammer all the oxy-acetylene kerf is removed, exposing the bright metal. This may require the removal of ⅛ in. of material. Then the welding surface is sand blasted to insure perfectly clean surfaces.

The weld is first built up on the outside of the ladle without reinforcement, using ¼-in. wire and the hot-arc method. It should be borne in mind that a ¼-in. electrode will penetrate deeper than a 5/32-in. electrode, so it is a waste of time to use the smaller electrode. As these ladles are 3½ and 4 in. thick, deep penetration is required. The job is also speeded up by using 24-in. electrodes, thus requiring less frequent changing of rods.

Next the outside weld is reinforced with straps. These are made necessary by the fact that the weld alone will not withstand the stresses set up by contraction and expansion caused by the sudden filling of the ladle with molten slag or matte, and cracks will develop in the weld.

The reinforcing straps are placed transverse to the weld and on the outside of the ladle, as Figs. 7 and 8 show. These straps are cut from boiler plate of ½-in. thickness, and they are made to extend not less than 6 in. on each side of the weld. They are tack welded in place, then heated and laid up absolutely tight against the ladle, and then fillet welds run around them.

If a hole is burnt through, we make a tin templet to fit the size of patch needed, lay the templet on an old scrap ladle, mark out the patch, and then cut it out and fit it into the hole and weld it in place.

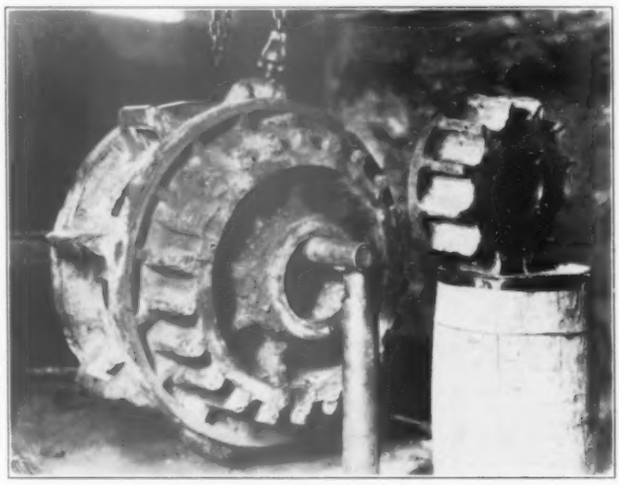
After the outside of the double-V crack is welded, and the straps are welded in place, we weld the inside. We start with ¼-in. low-carbon wire and fill the V one-half full, then we use high-carbon steel in one-quarter of the V, and finish the remaining one-quarter with hard-facing metal, using reverse polarity. The weld is built up flush with the inside surface of the ladle.

In the case of those smelters having, say, 20 or 30 of the same type of ladles in use, one sometimes cannot tell which is which. To distinguish the ladles one from another, numbers can be welded on them. Then when repair work is done on a ladle, the ladle number can be put on the charge account.

REPAIRING WORN GEARS BY ARC WELDING

The illustration shows two large gears and the method of repairing them by the electric arc welding process so that they could be returned to service at the least expense and in the fastest possible time.

These gears were in use on a steam shovel of the Golden & Boter Transfer Co., of Grand Rapids, Mich. It would



Pinion and Main Gear With Teeth Built Up by Welding.

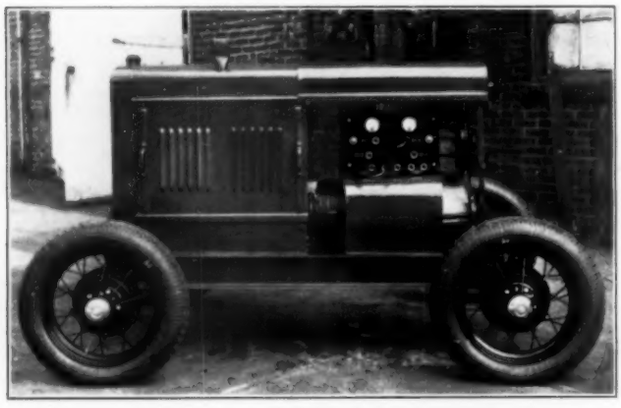
have cost approximately $380 to replace the main drive gear alone; but both this gear and the pinion gear, shown with it, were built up and returned to service by the Michigan Welding Co., of Grand Rapids, at a cost of $125. The welding current used in building up the teeth of these gears was furnished by a "Stable Arc" welder, manufactured by the Lincoln Electric Co., of Cleveland, Ohio. "Stable Arc" wire was also used.

The photograph shows the pinion gear before being built up, and the main driving gear after the metal was deposited by the electric arc but before the machining was done. The users of these gears state that when built up as shown, these gears outwear 5 sets of new gears. They have had many sets of gears repaired in this manner. The teeth on the outside circumference of the main gear to which the chain hoist is hooked, have also been built up by the electric arc.

NEW "DUALARC" ALL-PURPOSE WELDER

A new all-purpose welder for structural work has been announced by the Electric Arc Cutting & Welding Co., of Newark, N. J. The illustration shows the new "Dualarc" welding set complete, powered by a Buda "Hivelo" Model H-199 engine, making a very light, compact unit that can be dragged by tractors or animal-power over the roughest roads or ground of any kind that would be encountered in pipeline work or building construction.

This set is made in three sizes, one and two arc, thus meeting all conditions of both cutting and welding. The generator is arranged to supply alternating current through a separate transformer for lights, which do not dim while welding. This



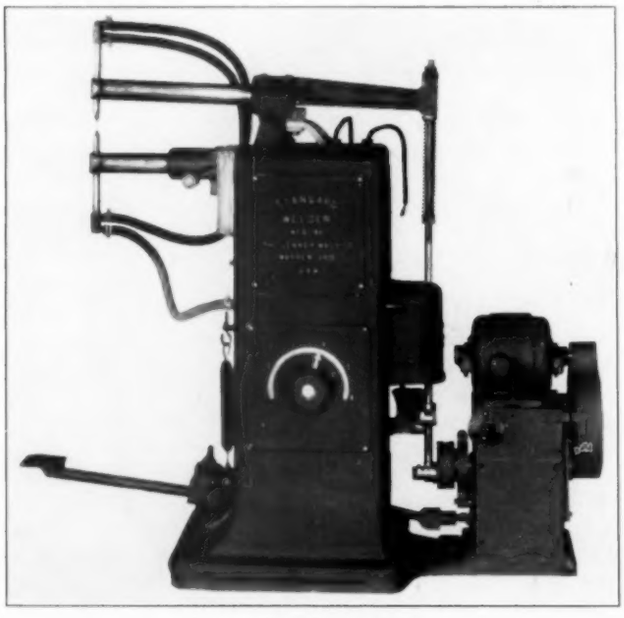
Engine-Driven Welder for General Welding Service.

transformer also provides power for the operation of drills, grinders, and the a.-c. semi-arc flash process, so popular in the automotive trade.

The engine is equipped with an electrically operated idling device, which operates to run the engine at low speed except when called upon for actual welding.

NEW AUTOMATIC SPOT WELDERS

A line of automatic spot welders designated as the ALA series is being made by The Lenney Machine & Manufacturing Co., Warren, Ohio. These are made in three sizes, which are rated at 7½, 10 and 15 kva., respectively. The smallest size will handle work of 16 to 30 gage in thickness; the next



New "Standard" Spot Welder.

size will take work up to 12 gage; and the largest size will weld metals of any thickness between 10 and 26 gage. The throat depth in all these machines is 12 in., and the over-all dimensions are 15x50x60 in. for the 7½-kva. machine and 15x50x52 in. for each of the others. The weights are 535, 580, and 605 lb., from the smallest to the largest capacity machines.

For slide horn machines, without automatic operation, a 6-in. standard slide is provided, or a longer slide of 18 in. A 24-in. slide can be had at additional cost. These machines have interchangeable water-cooled points and high-efficiency transformers.

NEW HOLCOMB WELDING GLOVE

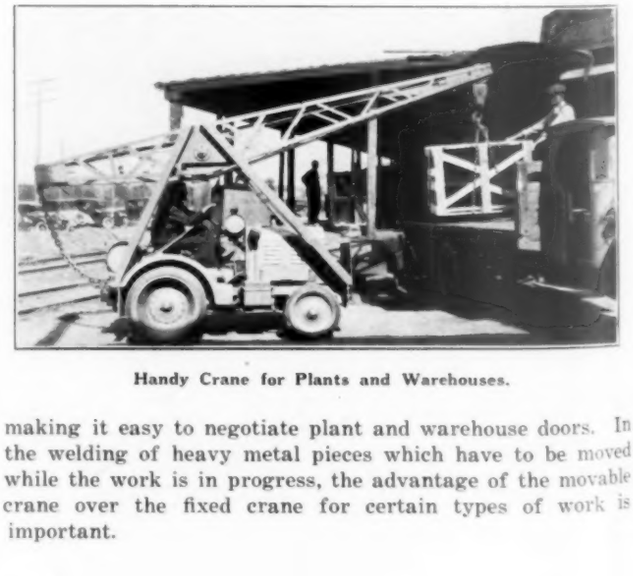
The Holcomb Safety Garment Co., Chicago, manufacturers of a complete line of protective clothing, recently introduced to the market a new type of welding glove, made of non-burnable suede leather. The left-hand glove has an extra

Reinforcements on These Suede Gloves Give Added Protection.

leather reinforcement on the back as an additional protection against heat and sparks. There is also an extra reinforcement on the inside of the right thumb. The special features claimed for these gloves are durability and comfort, since they are soft and pliable and offer great resistance to heat.

PORTABLE, VARIABLE-HEIGHT CRANE

This sturdy, variable-height crane has a capacity to lift 2,000 lb. to 13 ft., and yet when the boom is horizontal the entire equipment has an over-all height of but 7 ft. 10 in.,



Handy Crane for Plants and Warehouses.

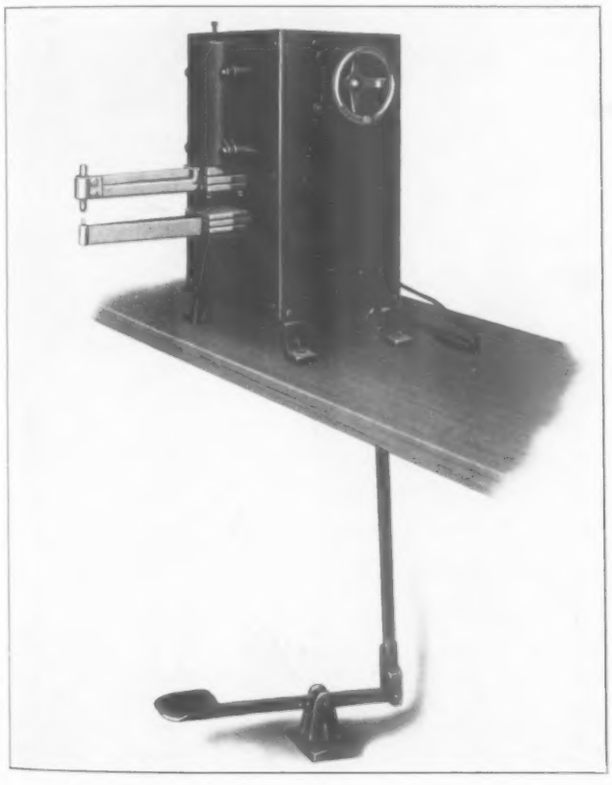
making it easy to negotiate plant and warehouse doors. In the welding of heavy metal pieces which have to be moved while the work is in progress, the advantage of the movable crane over the fixed crane for certain types of work is important.

The "Clarktor" crane is said to have shown notable economies in such work as placing heavy castings and forgings on drill presses, lathes, and other machine tools, and in handling heavy parts and machines in storage. It is especially useful in handling heavy crates, bundles, boxes, and other loads requiring chains or hooks. It tiers such loads easily, thus enabling the plant to utilize its "air rights" and conserve floor space.

The chassis is the rugged "Clarktor" Tructractor, which is said to have the shortest turning radius of any comparable industrial tractor, 108 in. Standard truck transmission, Clark truck axle and multiple-disc clutch insure dependable service. The equipment also includes a self-starter, generator, battery, and head and tail lights. The tractor-type gas engine uses five or six gallons of gas and a pint of oil daily, making operating costs low. The equipment is made by the Clark Tructractor Co., Battle Creek, Mich.

NEW AMERTRAN SPOT WELDING MACHINE

A quick-break contactor and adjustable pressure are two unusual features incorporated in the new AmerTran B-5 spot-welding machine, which has just been announced by the American Transformer Co., of Newark, N. J. The former, a semi-automatic device which opens the primary circuit at will, permits the weld to freeze under pressure and prevents arcing at the electrodes. Because the pressure is adjustable



Bench-Type Spot Welder Employing New Features in Design.

for various types of work and is applied by a heavy spring rather than the operator, the machine may be used for welding copper and brass, for resistance soldering, and for applications requiring heavy pressure.

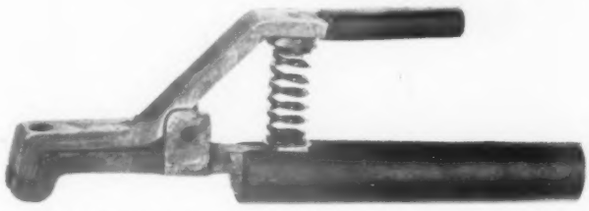
The AmerTran B-5 is a bench-type unit mounted in a compact sheet-steel case requiring a space of only 12 by 14 in. It stands 28 in. high and has two electrodes, which protrude 15 in. from the front of the case. The device operates from a standard 220-volt, 50/60-cycle circuit, and is available in three sizes—5, 7½, and 10 kva. Standard equipment includes a foot-pedal control and a six-point primary switch for adjusting the welding current to the value needed for the particular job.

Various electrodes are available, the type supplied depending upon the character of the work. In all cases the space between the points is adjustable, and, where the welder is to be used continuously, water-cooled electrodes are provided. The transformer employed is of the high-efficiency, short-coupled type; that is, the secondary leads have been made as short as possible to reduce heat losses to the absolute minimum.

The machine is capable of welding two sheets of steel of $\frac{3}{16}$-in. thickness or less, or two sheets of copper or brass of $\frac{1}{8}$-in. thickness, employing a ¼-in. spot weld in each case.

ELECTRODE HOLDER OF UNIQUE DESIGN

The illustration shows the Fort Pitt metallic-electrode holder, designed to hold the wire either in a horizontal or vertical position. The current is carried to the electrode by



With This Holder, the Electrode May Be Held Either Vertical or Horizontal.

a copper shunt, instead of through the jaws, which reduces the temperature of the entire holder. The spring is insulated from the body of the holder with two heavy fiber insulators; therefore no current passes through the spring, which should last the life of the holder without losing its resiliency.

The ends of the lower and upper jaws are offset at right angles in such a manner that they will fit into each other. A hole is drilled through the offset end of the lower jaw so that the electrode will pass through it and fit into a slot cut in the under side of the copper shunt, which is brazed to the under side of the lower jaw. This feature makes it possible to hold the electrode in a vertical position without twisting the hand. The vertical position of the electrode permits making welds in difficult corners.

When the electrode is in the vertical position, it is pressed firmly against the copper shunt by the bent-over end of the upper bar or jaw. Thus the electrode obtains its current direct by contact against the shunt bar.

The holder is so designed so that all six positions of the electrode are obtainable. The heavy hollow bakelite handle, which is a non-conductor of heat, naturally keeps cool.

This holder was designed and patented by Charles W. Shanaberger, Pittsburgh, Pa., and is distributed exclusively by F. R. Faulk, 50 Penn Ave., Pittsburgh, Pa.

HEAVY-DUTY FLEXARC WELDER FOR PIPE-LINE AND OTHER WORK

The gradual trend towards higher welding currents for use with large-size metallic and carbon electrodes to provide increased welding speeds in pipe-line work and other operations has brought about the development of a 600-amp., single-operator FlexArc welder by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. This welder will handle various sizes of electrodes, including bare and special coated rods requiring current values up to 750 amp., and is available with electric-motor or gasoline-engine drive and in stationary or portable models.

The new Westinghouse Flexactor, which is incorporated

in the welding circuit, eliminates current surges at the time of striking the arc and while welding, and provides extraordinary arc stabilization. The main generator is of the variable-voltage, constant-current type, operating at 1,450 r.p.m., and has a separately excited shunt field and a bucking series field. The separate-excitation feature is said to simplify the current control, provide rapid response to

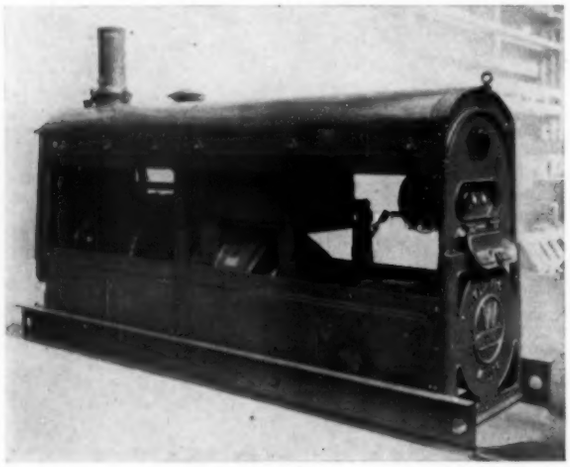


Fig. 1. New Welder for Pipe-Line Work in the Field.

changing arc conditions, and give a high over-all efficiency. The exciter is overhung from the bracket of the main generator, and its oversize allows it to be used as a source of auxiliary power besides functioning as an exciter. The generator control consists of a single-dial field rheostat for adjusting the welding current, ammeter, and voltmeter, and with each motor-operated set a push-button-operated magnetic-type starter is also provided.

A gas-engine-driven model of this welder is especially designed for field pipe-line welding, and is particularly adapted to rough and severe field service where sustained loads and high currents are required over long periods. This model is shown in Fig. 1. The main-generator frame fits directly into the engine-flywheel housing, making it possible to use a single-bearing, flexibly coupled generator. The generator control is mounted on the rear panel with a protective cover. The set is driven by a 6-cylinder gasoline engine with an S.A.E. rating of 51.2 and 83 brake hp. at 1,450 r.p.m. The complete unit, including also a 25-gal. fuel tank, large air cleaner, oil filter, and protective radiator guard, is mounted on common 8-in. welded channels and equipped with a sheet-metal canopy having removable sides

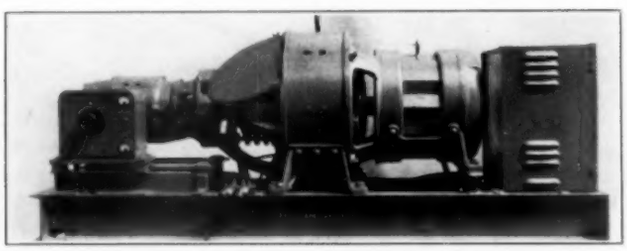


Fig. 2. A Motor-Generator Model.

and extending the full length of the set, thus providing weatherproof protection to the complete machine. The overall dimensions of this model are 121x34x72 in., and the approximate net weight is 5,000 lb.

In the motor-generator models, one of which is shown in Fig. 2, the motor and generator have a common shaft with two bracket-type bearings. The control is enclosed in a sheet-metal cabinet mounted beside the welding outlet leads. The Flexactor is mounted on the welded channel base under the exciter. The overall dimensions of this model are 96x28x40 in., and the weight is approximately 4,500 lb.

IMPORTS VARIED LINE OF OXY-ACETYLENE EQUIPMENT

A short time ago Jos. C. Paulus & Co., 2507 Potter St., Philadelphia, Pa., completed arrangements for importing a line of oxy-acetylene welding and cutting equipment covering a wide range of work. These devices are constructed on the injector principle to operate with low-pressure acetylene, and it is claimed that special construction features eliminate the possibility of back-firing. One interesting model is a combination cutting and welding torch. This has a welding range from $\frac{1}{32}$ in. to 1¼ in. plate and a cutting range from ⅛ in. to 12 in. thickness. A cutting carriage is furnished which can be used for either straight or bevel cutting. The illustration shows the Universal shaft with a welding head attached ready for welding. When it is necessary to make any change on account of going from one thickness to another, the entire head is changed instead of simply changing the tip. For cutting round holes, a special hole piercing head is attached to the Universal shaft. This can be made to revolve around a compass point which is adjustable from $\frac{3}{4}$ to 3 in. Another specialty is a cutting head for cutting boiler tubes from the inside. This can be used on tubes from

Universal Shaft With Welding Head Attached.

1¾ in. diameter up through the large sizes. A special rivet-cutting head which is equipped with a rest for holding the torch steady when cutting out countersunk rivets is also supplied and can be used with the standard Universal shaft. For small work a special brazing head is included. All of these heads are interchangeable and can be used on the same Universal shaft.

"ELKALOY" SPOT-WELDING ELECTRODES

A new electrode, known as "Elkaloy," for all manual spot-welding operations, has been developed by the Elkon Division of P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis, Ind. This consists of a hollow electrode holder in one end of which is screwed a water-cooling attachment having both an inlet and an outlet for the circulating water, and in the other end of which is inserted an Elkaloy replaceable tip. The Elkaloy tip is formed on a taper and forced into the electrode holder. The cooling-water hole runs through the shank practically to the end of the tip.

The Elkaloy tip is said to be 40% harder than copper and to last three to five times as long. The holder is made of copper and varies in size with the machine and the work.

Besides having a long life, Elkaloy does not adhere to many metals under heat and pressure as copper does. For example, the spot welding of scaly iron, galvanized iron, cadmium-plated metals, terne plate, and other coated metals, does not rapidly wear away the Elkaloy tip, and the Elkaloy electrodes maintain the same ratio of economical life between redressings as when used on clean, uncoated materials.

The replaceable Elkaloy tapered tips are made in three sizes, with both dome and flat tips as desired. Screwed tips are also made with offset and centered tips, these coming in six sizes. Used as electrode tips, Elkaloy has an electrical conductivity approximately that of copper. However, in its

physical characteristics it is in no way related to Elkonite, now extensvely used in the electric-resistance-welding field. Elkaloy is also being used for seam-welding rolls.

The manufacturers of Elkaloy point out that its low cost, combined with its long life, makes it the ideal material for all manual spot-welding operations. A descriptive circular on Elkaloy has been issued, giving prices and other information.

GIVES INSTRUCTIONS FOR WELDING MONEL AND NICKEL

Methods for the successful welding of monel metal or pure malleable nickel by the oxy-acetylene, metallic-arc, or electric resistance process, are described fully in a 12-page pamphlet recently issued by the Alloy Welding Processes Limited, Ferry Lane Works, Forest Road, London, E. 17, England. A table shows at a glance the relative advantages of the various processes with different thicknesses of metal, from 26 gage to ½ in., and enables the reader to select the welding process that will give the best results.

Information on gas welding of these metals relates to tip sizes, oxygen control, setting of the flame, fluxes, filler rod, and preparation of the work. Welding by the metallic arc and by spot and seam welders is not treated so fully, but the basic requirements are outlined so the welder should have no trouble making perfect joints after a little practice. Consideration is also given the application of monel-metal electrodes to the welding of damaged iron castings.

WILLIAMS ISSUES BOILER-TUBE PRICES

Williams & Company, Inc., Pittsburgh, Pa., recently issued a new price list on boiler tubes which they say is the most complete and easiest to interpret of any they have issued. Copper ferrule prices are shown on the back page of the price schedule. Attention is called to the fact that in a great many cases the use of copper ferrules will prove a real economy when installing tubes in an old boiler. They also point out that requirements for boiler-tube replacement will probably be much heavier than usual this season, and that in the case of larger boilers very careful consideration should be given to the desirability of installing complete sets of tubes rather than frequent replacements of a few tubes.

BOOKLET ON AUTOMATIC TORCH CUTTERS

Automatic shape-cutting machines, known as Geweco "K" Kutters, are illustrated and descriptions given of their uses as fabrication and mass-production machines, in a new pamphlet. Operation of the machines with and without templets is explained, and the making of templets either for hand guiding or full-automatic operation is illustrated. Interesting details cut on these machines—some of quite complicated shape—are shown and indicate the wide range of possibilities in the use of these machines. Copies of this pamphlet may be obtained by writing the General Welding & Equipment Co., 70 Lansdowne St., Boston, Mass.

ILLINOIS MAN WINS LINDE PRIZE

The contest conducted by The Linde Air Products Co. at their booth at the National Metal Exposition held in Chicago in September was won by Frank Molnar, of the Illinois Welding Works, Elmhurst, Ill., whose estimate of the average tensile strength of three welded specimens displayed at the booth was within 67 lb. of the actual figure obtained from tests. The three specimens were welded with Oxweld No. 1 High Test rod and showed an average tensile strength of 65,417.33 lb. per sq. in. Mr. Molnar's estimate was 65,350 lb. per sq. in.

Evidently those who visited the booth appreciate the strength of oxy-acetylene welds properly made with good materials, as most of the estimates were close to the correct figure.

During the week of the exposition, specimens were welded with No. 1 High Test rod, No. 21 High Strength bronze, and No. 7 mild-steel rod, all of Oxweld make, and tested to the breaking point. Welds made with the High Test rod in 50,000-lb. per sq. in. boiler plate averaged higher than 60,000 lb. per sq. in., and the bronze welds in the same type of base metal averaged over 58,000 lb. per sq. in. in ultimate tensile strength.

Each of those who participated in the contest were mailed literature on the Oxweld High Test welding rod and on bronze welding with the High Strength bronze welding rod.

KORO CORPORATION IN NEW BUILDING

The Koro Corporation, manufacturers of welding-wire products, recently moved from Waukegan, Ill., to a new plant which has just been completed at Bellwood, Ill., west of

New Koro Corporation Plant at Bellwood, Ill.

Chicago. The new plant has greater floor space than the Waukegan factory, and new machinery has been installed for processing and coating the Koro wires.

TO WELD ALLOY STEELS ON CONTRACT

The Electric Welding Co. of America, Inc., 744 Court St., Brooklyn, N. Y., has inaugrated a new department for alloy welding and has retained A. M. Ross, formerly of the U. S. Steel Corp., to take charge of the work of this department.

An associated company, Craftsmen Welders, Inc., recently completed their part of the work in the 450-ton, all-welded building, 300 ft. by three stories, for the New York Power & Light Corp., North Albany, N. Y., the welding of which was under the supervision of the General Electric Co. Craftsmen Welders have been awarded contracts for their part of the work in connection with the erection and welding of a 150-ton ramp at Schenectady, N. Y.

LINDE TO EXHIBIT AT POWER SHOW

The strength and dependability of power piping and equipment fabricated by oxy-acetylene welding will be the theme of The Linde Air Products Co. exhibit, in booths 334 and 335, at the Ninth Annual Exposition of Power and Mechanical Engineering, to be held at the Grand Central Palace, New York, December 1 to 6. J. R. Payden, H. H. Griffith, and T. G. Schwartz will be the representatives in attendance.

Special emphasis will be given to the use of oxy-acetylene welding in the installation of power piping and in the construction of pressure vessels. Complicated headers and pressure-vessel joints fabricated by oxwelding will be displayed. The Oxweld Type W-17 welding blowpipe with cutting attachment will be exhibited. A large map will show the nation-wide distribution facilities of the company and affiliated companies, which are units of the Union Carbide & Carbon Corp.

W. D. FLANNERY A DIRECTOR OF G. P. A.

In the publication of the names of the officers and directors elected by the Gas Products Association in the October issue of *The Welding Engineer*, there was omitted through a clerical error the name of W. D. Flannery of the K-G Welding & Cutting Co., New York City, from the list of the directors of the association.

1930 TULSA OIL SHOW SETS RECORD FOR WELDING EQUIPMENT EXHIBITED

The 1930 International Petroleum Exposition, held at Tulsa, Okla., October 4th to 11th, not only set a new record in estimated attendance of 150,000 and a valuation of $12,000,000 in exhibits; but also in number of welding equipment manufacturers represented it exceeded last year and was more than twice that of 1928. There were 16 such manufacturers exhibiting this year, compared with 14 last year and only 7 in 1928. A few other manufacturers were represented through distributors.

Besides the usual line of welding equipment there were noteworthy exhibits of the latest type of generators and portable welding machines. Practically every welding machine exhibited was of the portable type, indicating the preference of the oil industry for this type of equipment. A larger number of exhibitors showed torches and welding accessories, while others displayed carbide, hard-facing products, welded fittings, etc.

The Lincoln Electric Co., Cleveland, in connection with the Big 3 Welding & Equipment Co., Fort Worth, Tex., its Southwestern distributor, had a large outside booth showing various types of welding machines for oil-country use. A 300-amp. "Stable Arc" welder mounted on an International truck was introduced as a new product especially adapted for pipeline work. Another of the exhibits was a 400-amp. "Stable Arc" welder with automatic induction control. Other machines were on display and a demonstration of pipe welding was shown.

A comprehensive demonstration of welding, including both mild-steel welds and alloy steels for hardening, was staged by the Fusion Welding Corp., Chicago, which, with a gas-driven machine and a small arc welder, demonstrated its new Weldite rods for both gas and metallic-arc welding in pipeline and refinery work. Portable generator equipment was also shown by this company, including its new light models mounted on pneumatic tires for quick and easy traveling.

Another line of portable arc-welding machines, car mounted, was displayed by the Shrader Electric Co., Los Angeles. The Burdett Oxygen Co., Chicago, represented by its Oklahoma City branch manager, exhibited the improved Irwin generator manufactured at Amarillo, Tex., the only such equipment manufactured in the Southwest. The Union Carbide & Carbon Corp., New York, through its subsidiary, the Oxweld Acetylene Co., displayed a line of portable generators, as also did the Smith Welding Equipment Corp., Minneapolis, Minn. The latter demonstrated the use of natural and petroleum gases in welding.

Torches and welding accessories were shown by a large number of manufacturers, these including Air Reduction Sales Corp., New York, who displayed and demonstrated motor-driven oxy-acetylene machines; Imperial Brass Mfg. Co., Chicago; Modern Engineering Co., St. Louis; Smith Welding Equipment Corp., Minneapolis; Victor Welding Equipment Co., San Francisco; and Union Carbide & Carbon Corp., New York. The last-named, through the Oxweld Acetylene Co., a subsidiary, featured a guessing contest on

A Varied List of Welding Equipment Was Exhibited at the Tulsa Oil Show.

the average tensile strength of a piece of steel, using a No. 1 Oxweld High-Test rod. The correct guess, 65,000 lb., carried as a prize a set of Spaulding golf clubs, which was won by S. L. Estes, of the Indian Territory Illuminating Oil Co., Bartlesville, Okla., who came the closest to the figure.

Carbide exhibits were shown by the Shawinigan Products Corp., New York, and by the Air Reduction Sales Corp., National Carbide Sales Corp., and Union Carbide Co., also of New York.

Hard-facing materials were shown and demonstrated by the Haynes Stellite Co., Kokomo, Ind., and the Stoody Co., Whittier, Calif., also by the Blackor Co., Los Angeles. The first-named introduced a new product known as "Composite Rod," and for the first time exhibited a series of corrosion-resistant alloys which are said to resist hydrochloric, nitric and sulphuric acids, while being resistant to alkalies, organic acids, and other corrosive agents. A feature of the Stoody Co. exhibit was a drilling-bit-sharpening demonstration.

Welding rods were shown by the Stoody Co., Whittier, Calif., and the Page Steel & Wire Co., Bridgeport, Conn., in addition to the exhibits displayed by leading welding equipment manufacturers. The former featured alloy welding rods and metals, also electrode holders.

Tube-Turns, Inc., Louisville, Ky., showed samples of pipe welding on bends and radius fittings for pipe welding. The Babcock & Wilcox Tube Co., New York, exhibited a number of welded metals and fittings.

There was a wide list of products on display in which the use of welding was employed as in tanks, pipe, derricks, valves, fittings, etc. The A. O. Smith Corp., Milwaukee, exhibited its welded gas-line pipe; and the National Tank Co., Tulsa, and the American Tank & Equipment Corp., Oklahoma City, displayed welded steel tanks. The Crane Co., Chicago, displayed special valves beveled for welding. The National Tube Co., Pittsburgh, and the Republic Steel Corp., Youngstown, Ohio, both of which recently started production of electric welded pipe, had samples of their new pipe on display. There were numerous other products in which welding figured both in the manufacture and use.

NEWS OF THE INDUSTRY

The Weimer Welding & Cutting Co., 254 N. Fifth St., Milwaukee, Wis., is building a new shop at 703 Fourth St., according to an announcement by C. F. Weimer, proprietor. The new building will be 25x100 ft., of two-story and basement type, and of brick and concrete-block construction. When completed, it will represent an investment of $33,000, which includes the cost of the property. The success of this company in the job-welding field is evidenced by their need for more roomy quarters. They are also distributors for the Rego line of welding and cutting equipment.

The Micro Products Co., Peoria, Ill., announce the appointment of Sutor & Co., 2008 E. Slausen Ave., Los Angeles, Calif., with a branch office at 276 Monadnock Bldg., San Francisco, as distributors for their line of wire butt welders. The name of H. A. Schlatter & Co., Kuesnacht-Zurich, Switzerland, has been added to the list of foreign distributors. This Swiss concern also manufactures a line of heavy-duty resistance welding machines.

The Oliver Brothers Oil Tool Co., of Long Beach, Calif., who are designers and manufacturers of oil-well digging bits and also do general oil-field welding, recently opened a new plant in the Signal Hill field, at 3365 Cherry Ave. These brothers until recently were associated with the Allen-Oliver Co., of Compton, which organization is also manufacturers of digging bits and oil field tools.

The Lincoln Electric Co., Cleveland, Ohio, announce the promotion of W. S. Stewart, formerly in charge of the Pacific Coast offices of that company, to district manager in charge of the Cleveland territory, with offices at the factory, Coit Road and Kirby Ave. Mr. Stewart, after graduation from Yale University, spent a number of years in the factory of The Lincoln Electric Co., studying arc welding in all its phases. He was then transferred to the automatic arc welding department, where he demonstrated and applied the "Electronic Tornado" process of welding. Later he was transferred to the sales department and sent to the Pacific coast.

A new welding and repair shop is being opened at 1080 S. Main St., Los Angeles, Calif. The owners and partners are J. G. Olin and W. H. Wright, former employees of the Pickwick Stage System. General welding of all kinds by both gas and electric processes, together with machine work and general motor repairing, will be handled in the new shop.

A 22-in. all-electric-welded gas line running from Taft, Calif., to Santa Monica is nearing completion. The line is being constructed for the Southern California Gas Co., the welding portion of the work being done by the A. O. Smith Corp., of Milwaukee. Lining work, back filling, etc. is by the Macco Construction Co., of Long Beach, Calif.

The Irwin Welding Works, of Long Beach, Calif., recently established headquarters for their field equipment in the Venice oil field. Municipal regulations prohibit the use of stationary electric welding apparatus in this field, and it is for this reason that this concern has not erected a shop in the field, since all the work is done by portable machines and portable outfits.

The Goodman Electric Machinery Co., who specialize in the sale of rebuilt arc welders and spot welders, have greatly enlarged their facilities by moving their offices from 126 Green St., Newark, N. J., to larger quarters at 1060 Broad St., same city.

The specifications for the extension on the Mercy Hospital and the new Home for the Aged, of the Royal Neighbors, both at Davenport, Iowa, call for welded piping and the use of Tube-Turns, according to information received from Mr. Gustafson, of the Moline Welding Shop, Moline, Ill. Mr. Gustafson was recently appointed distributor in the Tri-City district for Tube-Turns.

The Hunter Manufacturing Co., Milwaukee, Wis., recently installed a 300-amp. Lincoln welder of the motor-generator type, to be used in the repair of contractors' equipment, in which this company deals.

Eccles & Davies, 320 San Pedro Ave., Los Angeles, Calif., were recently appointed distributors for the Hollup welding products, manufactured by the Hollup Corporation, Chicago, Ill.

The second of the season's meetings of the Los Angeles section of the American Welding Society was held at the Engineer's Club on October 9th. C. W. Martin, welding supervisor for the Western Pipe & Steel Co., gave an illustrated talk on "Weld Stresses." Paul Jeffers, structural engineer, who attended the recent National Metal Congress in Chicago, gave a talk on the meeting of the A. W. S. there. An interesting talk was made by Prof. F. W. Maxstadt, of the California Institute of Technology, on "Electric Generators."

The Torrance Welding & Machine Co., of Torrance, Calif., under the joint partnership of L. ("Whitie") Dillinger and Geo. D. Kipp, is being opened under a lease from the California Oil Tool Co. The shop is equipped to do all kinds of

electric and gas welding, and will feature oil field work. The company will also manufacture a special oil well digging bit.

Hobart Brothers Co., Troy, Ohio, have reorganized their Chicago organization with H. K. Miller in charge of sales and service, with offices at 3104 S. Michigan Ave. In the short time this new organization has been working, they report a great amount of interest created in the new Hobart gasoline-engine-driven welder. Among those in the Chicago territory who have purchased these new welders are the Cyclops Welding Co., LaSalle, Ill.; Kewanee Boiler Works, Kewanee, Ill.; Welstead Welding Co., Dixon, Ill.; Ross Bros. Boiler Co., Chicago; and Northeastern Welding & Boiler Co., Green Bay, Wis. Besides his Chicago connection, Mr. Miller is also one of the firm of Miller Brothers, of 1835 N. Third St., Milwaukee, Wis., who deal in Hobart Brothers welding equipment.

The Uhlin Machine Works, recently of San Pedro, Calif., are building a new and up-to-date plant at 320 West "B" St., in Wilmington, and will soon move into the new location. This shop does general welding and machine work, specializing on yacht and steamship repair work. E. R. Uhlin is owner and manager.

The R. G. Haskins Co., of Chicago, announces the appointment of Elmer P. Grismer as general sales manager, who will concentrate on the company's industrial division, and of L. D. Bowden as sales manager of the newly formed automotive division. Mr. Bowden formerly handled general sales of the company's portable electric flexible-shaft equipments in the Chicago and South Bend, Ind., territory.

R. D. Thomas & Co., Philadelphia, Pa., distributors of arc-welding equipment, electrodes and supplies, have moved their office and warehouse from Delaware Ave. and South St. to the Terminal Commerce Building, 401 N. Broad St. At the new location they have a demonstration room where arc and spot welding equipment may be seen and operated.

Mr. Paulus, who recently closed his shop at 2904 Santa Fe Ave., Los Angeles, Calif., as announced in the September issue of *The Welding Engineer*, has returned to Milwaukee, Wis., and opened a new shop at the corner of East Water and Broadway. Mr. Paulus was with the Good Welding Co., of Milwaukee, before going to Los Angeles.

Two very interesting papers were read before The Institution of Welding Engineers at their recent meetings held in London, England, according to announcements recently received. At the October 16th meeting, P. L. Roberts read a paper on "The Replacement of Castings by Weldings," and on November 13th A. E. Shorter discussed "Metal-Surface Hardening." Both papers were illustrated with lantern slides.

The Milford Machine Shop, of Milford, Kan., recently purchased a 300-amp. Lincoln gas-engine welder mounted on a trailer. This shop, says L. R. Knapp, manager, is now one of the best equipped machine shops for welding in the central part of Kansas as no other shop in that district has a direct-current machine. Besides doing a general repair business, this shop specializes in hard surfacing by both the electric and oxy-acetylene processes and in oil field welding. Mr. Knapp is a graduate of the Lincoln and General Electric schools and was formerly welder foreman for the Amerada Petroleum Corp.

The Bucklein Manufacturing Co., of Los Angeles, Calif., recently moved from their old location on San Pedro St. to 1559 Fishburn Ave., where they have erected a new and modern plant. The company features the manufacture of sheet metal products and at present is specializing on bottling plant equipment. They report the recent installation of a new 100-amp. Lincoln electric welder.

The Midway Fishing Tool Co., located in the Signal Hill, Calif., oil field, is adding a welding department to its plant at Spring and Cherry Aves. A new building for the purpose has been erected and equipped with both gas and electric welding equipment, including a new 300-amp Lincoln electric welder. The company manufactures all kinds of oil well fishing tools and other oil field specialties.

The Alco Oil Tool Co., whose plant is located near Compton, Calif., report the recent purchase and installation of two new 300-amp. Lincoln electric welders. This company manufactures oil well digging bits.

The Oceanside (Calif.) Welding Works recently completed an artistic job of welding in the installation of the lighting apparatus for a local golf course. A marked saving was also made for the owner of the course by the welded job. A new 300-amp. Hansen electric welder was recently installed in the Oceanside shop. Ed. Wright is the proprietor.

W. H. Bolanu, of the Lectrox Co., Peoria, Ill., announces that his company has taken over the distribution of Skelgas in the Peoria district. R. E. Duncan has been placed in charge of this department of the business, and a well-appointed sales room has been set up in the business district of the city. Mr. Bolanu states that Skelgas is ideal for the home that is not furnished with either artificial or natural gas, and he anticipates doing a large business in the sale of this commodity.

The Board of Education of the city of Milwaukee, Wis., recently installed two 200-amp. Hansen motor-generator welding units, one at the Milwaukee Vocational School and the other at the Boys Technical High School.

R. A. Vaughan, organizer and manager of the Welders Supply Co., 333 Sixth St. N. W., Canton, Ohio, reports a very noticeable pickup in business conditions in the Canton district. His company has enjoyed a very satisfactory volume of business during the past year in the sale of Harris cutting and welding torches, National oxygen, U. S. L. arc welding machines, and welding rods and supplies. They also maintain a service department for repairing all makes of welding and cutting equipment.

The Los Angeles, Calif., branch of Dwight P. Robinson & Co., are doing the structural work on a plant for the American Potash & Chemical Corp., at Trona, Calif. The Robinson company recently purchased two 300-amp. Lincoln electric welders for the work at Trona.

Major James Caldwell, 14-16 Cockspur St., London, S. W. 1, England, formerly managing director of Alloy Welding Processes, Ltd., has resigned his position as chairman of that company and sailed on October 17th for an extended world tour, in the course of which he intends to inspect welding undertakings abroad. Major Caldwell is well known as a pioneer in the development of electric welded construction and many of his writings on this subject have been published. His itinerary includes South Africa, India and Ceylon, Australia and New Zealand, and the United States. His sojourn in this country will extend from March 20th to the middle of May, according to present plans.

At the recent election of officers of the Chain Belt Co., of Milwaukee, Wis., C. F. Messinger, vice-president, was elected general manager; H. S. Greene was elected as general sales manager; Brinton Welser, formerly secretary, was

Giant slag crusher repaired with Tobin Bronze by the oxy-acetylene process.

Huge Slag Crusher repair-welded in 16½ hours, with TOBIN BRONZE

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Tobin Bronze*	1625°F
Manganese Bronze	1598°F
Brazing Metal	1634°F
Naval Bronze	1625°F
Electrolytic Copper	1981°F
Silicon Copper	1981°F
Phosphor Bronze	1922°F
Everdur*	1866°F

for arc welding

Silicon Copper	1981°F
Phosphor Bronze	1922°F
Everdur*	1866°F

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WHEN the cast-iron arm of this slag crusher was fractured, a serious delay seemed certain. But Tobin Bronze Welding restored the machine to service after a loss of only a few days' time. One day was spent in pre-heating —another in chipping. Actual welding time was 16½ hours. 325 lbs. of Tobin Bronze and 2900 feet of gas were used.

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WELDING RODS

elected director and vice-president; and A. R. Abelt was elected secretary and continues in charge of chain sales. J. C. Merwin was re-elected as vice-president, and W. H. Brandt, formerly assistant secretary, becomes assistant to the president. President C. R. Messinger announces that the expansion of the company has made it necessary to provide additional executive personnel.

The Pomona Valley Machine Works, of Pomona, Calif., recently added a welding department to their plant at 163 E. Commercial St. The shop is equipped for both acetylene and electric welding, and a general welding service of all kinds will be maintained. John McKean is president and shop superintendent.

A new welding shop has been opened at 1412 West Slauson Ave., in Los Angeles, Calif., by Messrs. Thompson and Long. This location was recently occupied by the Guaranty Welding Works, which dissolved partnership a short time ago. The new occupants of the shop will feature all kinds of general welding work. The shop, which is well equipped for both gas and electric welding, will be known as the Thompson & Long Welding Works.

Ivan M. Pinjuv, owner of the Manchester Iron Works at 8608 S. Western Ave., Los Angeles, Calif., is moving his plant to Las Vegas, Nev., where work on the Boulder Dam project will soon be under way. Mr. Pinjuv will feature general welding and blacksmithing, together with the special service of automobile-starter-teeth welding. The shop will be known as the Las Vegas Iron Works, and will be located at 715 Ogden St.

Classified Ads

Help Wanted—75c per line, minimum 4 lines.
Jobs Wanted—4 lines free.
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Count 8 words to line. Add 6 words for keyed address.

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Salesman, with several years' experience selling and demonstrating a.c. and d.c. arc-welding sets, oxy-acetylene welding and cutting equipment, and accessories for both, is open for position Dec. 1st. Address Box 288, The Welding Engineer.

Acetylene and Arc Welder, with 10 years' experience on job-shop, pipe, sheet-metal, boiler, structural, and auto welding, desires permanent position anywhere in U. S., but prefers Chicago or vicinity. Address Box 282, The Welding Engineer.

Welding Instructor or Supervisor.—Man, 35 years old, single, with 10 years' experience as salesman and service man of welding equipment, both gas and electric; also practical welder. Desires permanent connection as instructor or supervisor of welding with firm in South America, Russia, or Philippine Islands. Address Box 290, The Welding Engineer.

Salesman—Oxy-Acetylene equipment and gases. Years of experience in sales and service. Thoroughly acquainted with Chicago territory. Address Box 291, The Welding Engineer.

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25 Arc Welders, used, motor-generator sets, standard makes; must be cheap and in A-1 condition. C. H. Dockson Co., 40 W. Milwaukee Ave., Detroit, Mich.

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1 Continental six-cylinder DUALARC on Ford truck	900
1 Reo six-cylinder DUALARC	750
1 General Electric, WD200, Buda engine drive, standard motor, with steel housing and tractor wheels. Complete as arranged for oil-field or pipe-line use	900
1 Wilson, 300-amp., gas-engine set on wheels but without housing	700
1 U. S. L. complete on wheels	700
2 Westinghouse motor-generators, four bearing, old style but in good shape, 30-300 amp.	500
40-400 amp.	600
1 General Electric single-phase set that will operate on any power supply, single-phase, two-phase,three-phase, 110/220 volts	600
1 Century complete with brush-shifting mechanism	500
DUALARCS that have been rented one or two months, as good as new and with regular guarantee:	
20-200 amp.	500
30-300 amp.	575
40-400 amp.	650
1 DUALARC, generator only, suitable for gas drive, rented, but in perfect condition	450
1 shop belt-driven grinder, double	35
1 electric-motor shaft grinder, complete	35
1 Wilson type "S," complete, operating on both d.c. and a.c., mounted on truck	350
2 Lincoln model "F" sets, one on a truck	400
one without a truck	375
1 300-amp. U. S. L., complete	450
1 Siemund-Wenzel, Crocker Wheeler, complete, latest style, 300 to 400 amp.	500
1 General Electric, model WD9	450
1 Old Style DUALARC, 200 amp.	375
1 New Style DUALARC, 200 amp.	500
1 New Style DUALARC, 300-400 amp.	600

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